NOVEMBER 1960

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ILLUMINATING ENGINEERING

Journal of the
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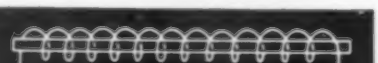

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Plan to Enter Your Local

IES Applied Lighting Competition

Entry Forms available soon from IES Headquarters for the 1961 Competition. Send for yours today. Easy rules on next page.

- **AWARDS**
- **RECOGNITION**
- **SERVICE**
- **TRAVEL PRIZE**

APPLIED LIGHTING COMPETITION

Go ahead and clip it. Rules are also printed on the inside of the Entry Form.

Paste on 3-cent postal and mail today

To: John K. Michel
Office Manager
Illuminating Engineering Society
1860 Broadway
New York 23, N. Y.

Please send me Entry Form for the 1961 IES Applied Lighting Competition. My address is:

_____

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_____

IES Applied Lighting Competition

CLASSIFICATIONS

There are two classifications for entries in the competition. Class I — Residential Lighting — interior and/or exterior applications. Class II—Commercial, Industrial or any other lighting application as shown in the *IES Lighting Handbook*, Third Edition (Sections 10 to 24). Final decision as to which category an entry may compete in is that of the competition chairman, Local, Regional or National. No contestant may present more than one entry in any one class.

ELIGIBILITY—ENTRY INFORMATION

1. Competition is open to Associates, full Members or Fellows of the Society, or members of a Residence Lighting Forum affiliated with the Society.

2. An entry may be made by an individual or by a team.

3. A lighting installation entered in the competition must be completed during the 18 months preceding the local competition.

4. Entries must not have been entered previously in another contest not affiliated with the Society.

5. Where a lighting installation or application is outside the area covered by the Section or Chapter with which the member is affiliated, then only the originator of the lighting design is eligible. Such an entry should be reported to the Regional Vice-President for clearance with the Section or Chapter area involved.

6. Submit entries in the official form folder.

7. First right of publication (free) is to ILLUMINATING ENGINEERING, the official publication of the Society.

8. For Section or Chapter competition, clear with the competition chairman before completion, to ensure acceptance for presentation. If more entries are submitted than can be presented within the normal time of a meeting, the chairman may request summaries to be submitted so the Board of Judges may rule on their acceptance.

9. No mention, nor identifiable illustration of a specific lighting product name may appear on any part of the presentation.

10. Presentation is limited to ten minutes, with judging penalty for overtime.

11. For visual presentation, competitors may use up to a maximum of 12 slides (preferably 2- x 2-inch 35-mm color transparencies). For publication, the entry should also include black and white glossy print photographs (preferably not smaller than 5 x 7 inches).

JUDGING

Entries in either classification are judged on:

The Problem—extent of difficulty which the lighting problem presented.

The Solution—ingenuity exercised in solving the installation problem.

Usefulness of the Solution—usefulness to the user and value to Society members as an example of good current lighting practice.

Presentation—organization of the presentation. (Contestants are not judged on oral delivery).

AWARDS

Cash prizes, merit award certificates, and trophies are awarded to the winning entries in each class as follows:

Section and Chapter Competitions

First Prize—$15.00 and Award Certificate.
Second Prize—$10.00 and Award Certificate.
Note: Upon request a duplicate copy of an Award Certificate may be obtained for the owner of an installation.

Regional Conference Competitions

First Prize—$75.00 and Award Certificate. (Winner will be eligible to participate in a $1000 prize fund from the National budget to be allocated among the Regional winners based on the mileage from the Regional Conference city to the National Conference city. This money must be applied for, through the National Applied Lighting Competition Committee and will be granted only to those winners attending the National Conference.
Second Prize—$15.00 and Award Certificate.
Third Prize—$10.00 and Award Certificate.

National Technical Conference Competition

First Prize—$100.00 and Award Certificate.
Second Prize—$50.00 and Award Certificate.
Third Prize—$25.00 and Award Certificate.
Fourth Prize—$15.00 and Award Certificate.

The President Goddard Trophy (silver cup) is presented jointly to the First Prize winners in both classes, and their names are inscribed on the trophy. Silver miniatures of the trophy are presented to these winning contestants in each class, for permanent possession.

NOTE—If a contestant cannot attend a competition (Local, Regional or National), he may select a proxy to present his entry. For the Local Competition, proxy shall be a member of contestant's Section or Chapter; for Regional and National Competitions, a member of the contestant's Region. Contestants in the National Competition are urged to make their presentation themselves or by proxy. If this is not possible, however, an entry may be submitted for presentation on tape recording, on application to the National Committee.

The competition is conducted under a uniform set of rules to assure equality to all participants. In case of doubt as to interpretation of any rule, the decision of the National Competition Committee is final.

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

November 1960

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STATEMENTS and opinions in articles and papers in ILLUMINATING ENGINEERING are the expressions of contributors and do not necessarily represent the policies or opinions of the Society. Official Society opinions are expressed only in official committee reports specifically approved by the Council of the Illuminating Engineering Society.

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Day-Brite lighting helps make the new Pius XII Memorial Library a center of attraction on the St. Louis U. campus.

Day-Brite Troffers with Cleartex® Plastic Lens Panels deliver 73 footcandles of illumination to reading areas.

Architect and Engineer: Leo A. Daly • Electrical Contractor: Sachs Electric Corp.

How Day-Brite lighting "sells" reading in the new Pius XII Memorial Library

From the architect's first draft to the final choice of curtains, St. Louis University's modern new library was planned with one goal in mind: to encourage students to *use* it.

Self-service, open-type book shelves were used to invite "browsing" among the stacks. "Wide-open" interior design helped create a pleasant atmosphere. In addition, comfortable bright-colored furniture was contrasted against light-colored walls and a noiseless cork floor.

Lighting, of course, was a major consideration. It had to facilitate reading and, at the same time, add to the over-all cheerfulness. Day-Brite lighting was specified for high-level, high-quality illumination and clean, modern fixture design.

Good vision calls for good lighting. And you display good vision when you call in your Day-Brite representative early. *Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

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Personnel and Products Get High Lighting Utility at This Utility

INSTALLATION: Cape & Vineyard Electric Company, Falmouth, Massachusetts
AREA SHOWN: Showroom and Office
ARCHITECT: Hillman & Wilson, Falmouth, Massachusetts
ENGINEER: Joseph Smith and Ned Hudson, Cape & Vineyard Electric Co.
ELECTRICAL CONTRACTOR: Quinn Electric Company, Falmouth, Massachusetts
DISTRIBUTOR: Finberg Supply Company, Lawrence, Massachusetts
DISTRICT SALES ENGINEER FOR LITECONTROL CORPORATION: Dallas G. Dearmin, 5 Hillcrest Avenue, Greenville, Rhode Island
FIXTURES: 1 — Luminous Lens Ceiling, using Holophane #6024 acrylic lenses; 40 watt Rapid Start strip fixtures on 24" centers. 1 — Luminous Ceiling using yellow Plastic Grid Louvers, 45° x 45° shielding; 40 watt Rapid Start strip fixtures 12" on centers, wired on dimming ballasts. Series 1500 two lamp Rapid Start troffers, using Holophane #6010 Concave Acrylic Lenses, in balance of area.
CEILING HEIGHT: Approximately 10 feet
INTENSITY: Average overall, approximately 200 foot-candles in service.

Perhaps this showroom and office of the Cape & Vineyard Electric Company can't compete with the scenic wonders of Cape Cod. But in the area of interior commercial lighting, the efficiency of this installation deserves a second look.

Note how luminous ceiling panels have been dropped 10" and framed to simulate a large area surface fixture. This is an imaginative and practical way of using lens ceilings where the ceiling cannot be lowered and demonstrates the flexibility of Litecontrol luminous ceiling systems. In the showroom, yellow plastic grid louvers provide color as well as an excellent intensity level which is variable by means of dimming ballasts and controls. Our series 1500 low-brightness lens troffers, with Holophane #6010 concave acrylic lens is also used. The shape keeps brightness down, maintains efficiency.

These fixtures are carefully designed and built for rigidity and good alignment. See the way troffers and ceiling panels are installed in perfectly straight lines. See *your* way to quality lighting at lower cost with Litecontrol.

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LITECONTROL CORPORATION,

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DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

NATIONAL PRIZE WINNERS
IES Applied Lighting Competition

Applied Knowledge -- Applied Imagination -- Applied Engineering -- these are the characteristics of excellence in Applied Lighting. Leading the field in such excellence are the eight installations shown on this and the following 20 pages, the top four winners in both classes of the Applied Lighting Competition.

Moisant International Airport

FIRST PRIZE
CLASS II

ALTHOUGH this splendid building presented many lighting problems, one of the most interesting involved the Main Concourse. This huge arch-roofed area is the dominant architectural feature of New Orleans' new air terminal. Stated in a few words, the basic problem was to produce a lighting system in keeping with the design but with an appearance of the utmost simplicity. In detail, the problem included other factors.

The architects would accept only minimum interference with their basic concept of tremendous spaciousness for their huge interior 200 feet long, 80 feet wide at the base, 53 feet high on center line, and almost parabolic in section. Another requirement was minimum interference with visibility of the 52-foot-high, all-glass end walls. Further important restrictions: keep the walls free of lighting units; no visible sources of high brightness; no scallops, or striations. Fifty footcandles minimum was required over the seating area for reading.

Louis N. Goodman
New Orleans Section
South Central Region

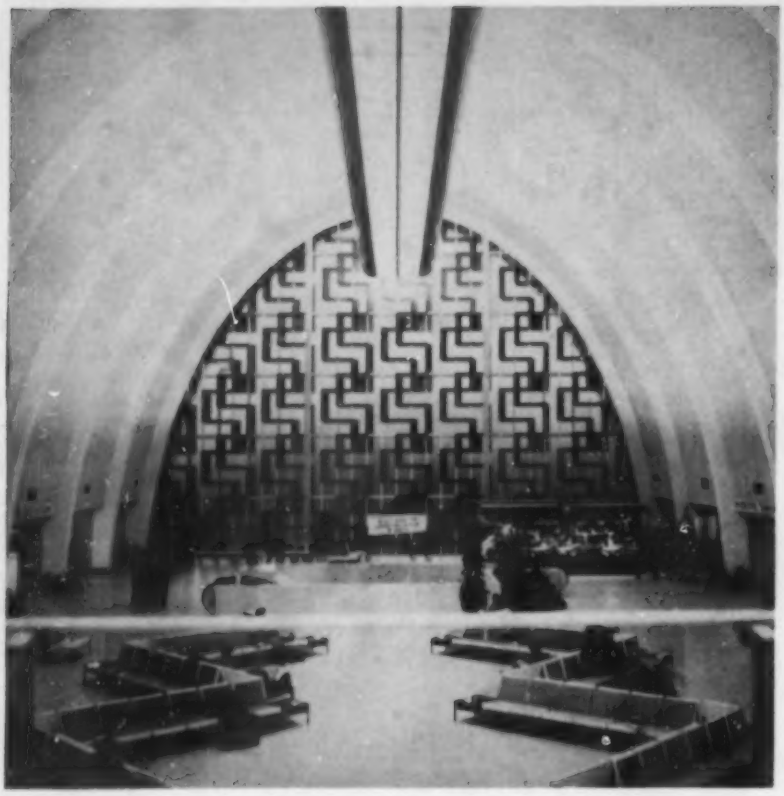
Mr. Goodman is president of Louis N. Goodman & Associates, Consulting Engineers, New Orleans.

Physical facets of the design problem included:

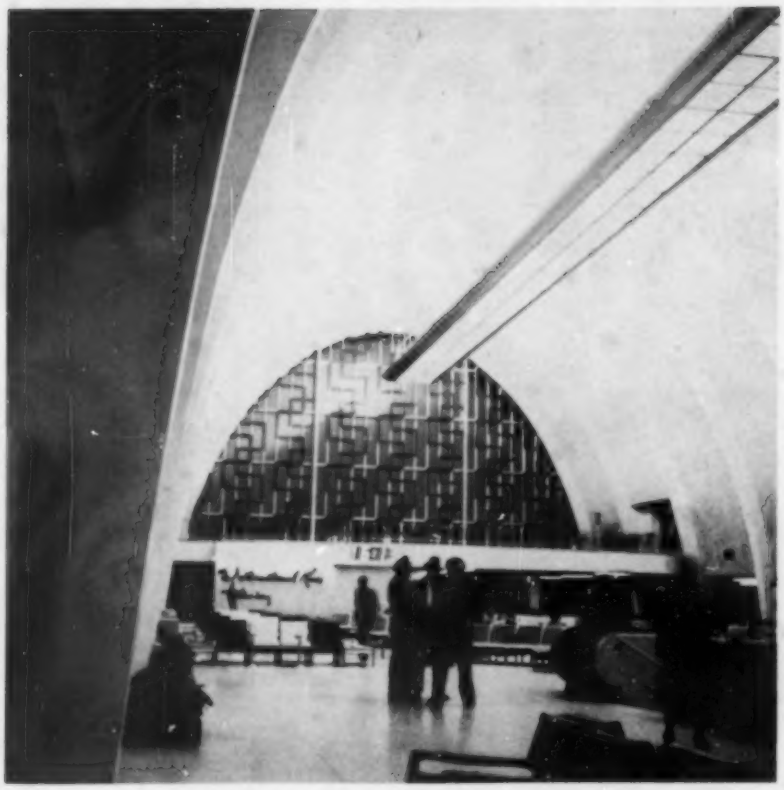
- The thin-shell roof precluded recessing of fixtures, or use of lowering mechanisms for luminaires, since there is no attic.
- Large seating area and heavy pedestrian traffic day and night precluded use of surface-mounted, or individual pendant lighting equipment requiring service from the Concourse floor.
- Sight lines from a spectators' balcony prevented the use of coves at the bottom of the arched wall.
- Two further aspects of the design problem were lack of guiding precedents, and lack of applicable, commercially available luminaires.

Solution

It was planned that access for servicing be from the spectators' observation deck at the north end of the Concourse, because of its low pedestrian traffic. Since access to the lighting equipment had to be from one end only it was obvious that servicing would have to be done from the equipment it-



View of Main Concourse, Moisant International Airport, looking toward 52-foot-high glass end wall. Note that fixture is mounted high enough so that it does not interfere with the architectural effect of the arched roof.



Long sweeping lines of the specially constructed fixture blend with the flow of the architectural design. The fixture, which provides both up- and downlight, yields 50 to 60 footcandles, maintained on the center line of the terminal.

self, which would have to be suspended and continuous. For minimum architectural interference there should be one continuous element which should mask as little as possible of the huge vaulted ceiling, particularly the top, and consequently should be narrow and mounted as high as practicable.

To minimize interference with the view of the end window walls the luminaire was terminated 20 feet from each end wall, making it 160 feet long. It was decided that a unit with dominant long straight lines parallel to the 200-foot-long concourse walls would most easily harmonize with the architectural features of the huge interior.

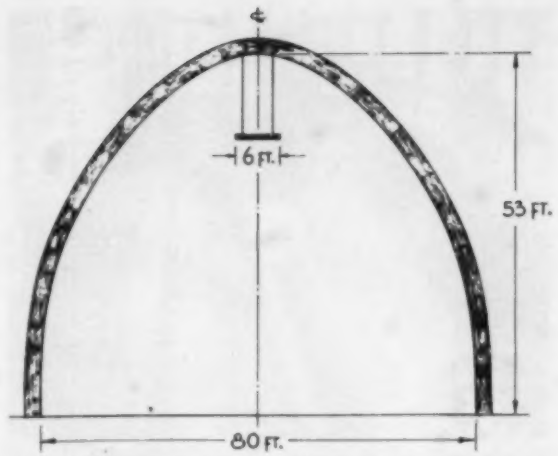
Since architectural and physical requirements had determined generally the *shape* of the lighting unit, and that it should be mounted "high," what should the light source consist of and what should be its actual mounting height? A tremendous wall and ceiling area of potential reflecting surface of 85 per cent reflectance, suggested indirect lighting. If an unshielded point source of light were placed at the theoretical focus of the parabola we should obtain proportionate good coverage of the white wall reflecting surface, and theoretically, the reflected light would be reflected straight downward. With a relatively narrow fixture body only a small amount of direct light would be masked from the walls, and a small amount of the reflected light intercepted from overhead. The focal point was 7 feet 5 inches down from the top of the arch.

Preliminary calculations using several different light sources and arrangements showed that power consumption, and cost of attendant details to produce 50 footcandles over the reading area, with strictly indirect lighting, was prohibitive. A supplementary source of direct lighting over the reading area would be required.

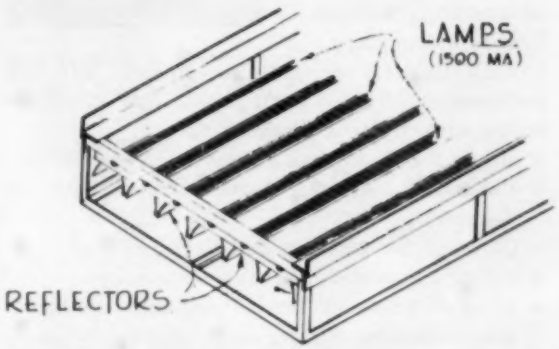
At this stage a basic decision was made to supply sufficient, well-shielded *direct* lighting for at least 40 footcandles over the reading area, and to use sufficient *indirect* lighting to adequately light the shell, supplement the intensity over the reading area by at least 15 footcandles, and to add color warmth to the entire interior.

The direct lighting section was designed to consist of six continuous rows of 1500-milliamp warm white, fluorescent lamps, each row in continuous, Alzak-finished, parabolic reflectors, and the six rows well shielded by 60-degree cut-off anodized aluminum louvers. With no previously established design data available, judgment suggested an assumed coefficient of utilization of .45 and a maintenance factor of .65.

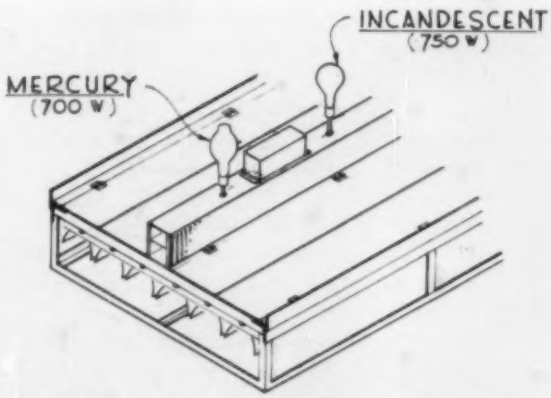
The indirect lighting section was designed with 26 700-watt improved-color mercury lamps and 46 750-watt white-coated incandescent lamps. Coated incandescent lamps were specified for better diffu-



Architectural specifications for the luminaire required one continuous element which would obscure as little as possible of the dominant vaulted ceiling, particularly at the top. This resulted in a luminaire six feet wide and 160 feet long, mounted parallel to the 200-foot-long Concourse walls.

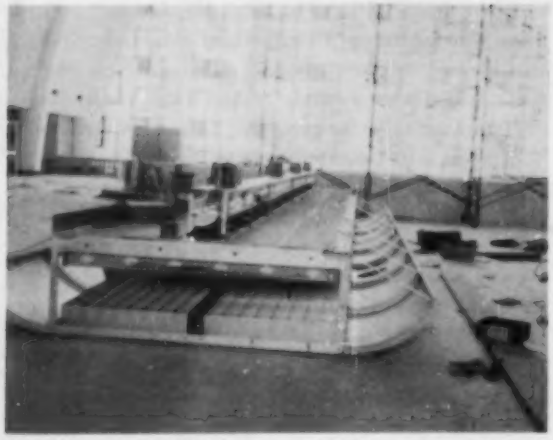


Direct lighting section of the luminaire is composed of six continuous rows of 1500-ma warm white fluorescent lamps. Each row is in continuous Alzak-finished parabolic reflectors and shielded by andozied aluminum louvers which provide 60-degree cut off.



Indirect lighting section uses twenty-six 700-watt improved-color mercury lamps and forty-six 750-watt white-coated incandescent lamps. White-coated lamps were chosen for good diffusion and soft shadows.

Maintenance of fluorescent lamps is through hinged ¼-inch aluminum "checker plates" which make up catwalk floor. Bottom louver sections can be lifted out after fluorescent lamps and reflectors have been removed.



The fixture is 160 feet long, weighs approximately 21,000 pounds and is supported by 52 one-inch steel rods, symmetrically spaced relative to the arched girders. Power consumption is 85,000 watts.

sion and softer shadows. No reflectors were used. An assumed coefficient of utilization of .2 and a maintenance factor of .60 were used in the indirect lighting calculations.

With lighting elements determined, the real problems of physical arrangement and *structural* design came to light. Some of these:

- Means for fluorescent relamping from above.
- Means for removing louvers from above for cleaning.
- Catwalks for access to full length of unit.
- Railings to protect maintenance men.
- Divided wireways for normal and emergency power circuits.
- Location of fluorescent and mercury ballasts for proper ventilation and heat conduction.
- A structural frame and supporting rods of ample strength to support all elements, plus concentrated load of at least four men, all with ample safety factor.
- Provisions for speakers of P-A system.

Structural and arrangement problems were solved by design of a modular unit, long enough and wide enough for six 8-foot fluorescent tubes and mating cross wireways at each end, all mounted within a structural aluminum alloy frame.

This basic unit is 6 feet wide, to which was added on each side, for appearance, a curved "skirt" of aluminum. Over-all width is 10 feet. Public address system speakers are mounted over ports in the skirt.

Access to the fluorescent tubes is through hinged one-quarter-inch aluminum "checker plates," which make up the catwalk floor. Bottom louver sections may be lifted out by first removing fluorescent lamps and their two-part parabolic reflectors. A continuous, ventilated wireway supports the incandescent and mercury lamps and mercury ballasts. Fluorescent ballasts are mounted inside wireway.

Twenty of the modular units were required. They are bolted together through back-to-back mating aluminum channels. Good visibility of the top of the arch being so important, mounting height is 14 feet down from top of arch to catwalk. Consequently, light centers of indirect sources are 11 feet 6 inches down from the top of arch, which is 4 feet 1 inch below the theoretical focal point. The resulting deflection of reflected light toward the seating area is minor, being only 7½ degrees off the vertical. Fluorescent lamps are 38 feet 6 inches from the floor.

The entire fixture, 160 feet long, and about 21,000 pounds, is supported from 52 one-inch steel rods, symmetrically spaced relative to the arched girders. Power consumption is 85,000 watts.

The design has been vindicated by results. Initial intensity at reading level varied from 75 footcandles on center line to 65 at edges of seating area and to 45 at wall lines. Gradation of brightness down the walls progresses smoothly. The incandescent lamps contribute warmth to the appearance of the interior, and colors appear natural. A phototube actuated step-controller maintains between 50 and 60 footcandles on center line, day and night, by automatically controlling mercury and incandescent circuits.

One final virtue—in spite of its size the luminaire has gone unnoticed by many people. Due to the heavily louvered direct lighting source, and the invisible indirect sources, the Concourse is brightly lighted without consciousness of a light source. A lighting instrument designed on an immense scale has been unobtrusively integrated into the physical interior.

Flexibility . . .
Theme of Home Lighting

A PLEA FOR the creative exploitation of the dynamic qualities of light was the central theme of the panel on "Esthetics and Psychological Effects of Lighting" in the August issue of IE. The panelists emphasized the enormous potentials of lighting design for the enrichment of our everyday environments—through variation in color, intensity and form.

The lighting in the home selected as the outstanding residential installation in the IES Applied Lighting Competition demonstrates that these suggestions are practical; indeed, when the lighting designer takes advantage of his flexible medium, the possibilities for variation are endless.

The owner of this house *was* the lighting designer and did not have to be convinced of the principles of good lighting — need for adequate footcandle levels, brightness balance. These were the foundations upon which the imaginative design was built.

The interior of the house is 1100 square feet in area. All walls are painted flat oyster white, 75 per cent RF; ceilings, white, 85 per cent RF; floor coverings, in the white family, minimum of 50 per cent RF. Minimum average lighting level throughout the house is 25 fc, with higher levels in work areas. Brightness ratios are controllable to 2:1 or better. All lighting is built in, with the exception of a chandelier in the master bedroom.

Exterior, living room and porch photographs courtesy General Electric Co.

Sylvan R. Shemitz
Connecticut Section
Northeastern Region

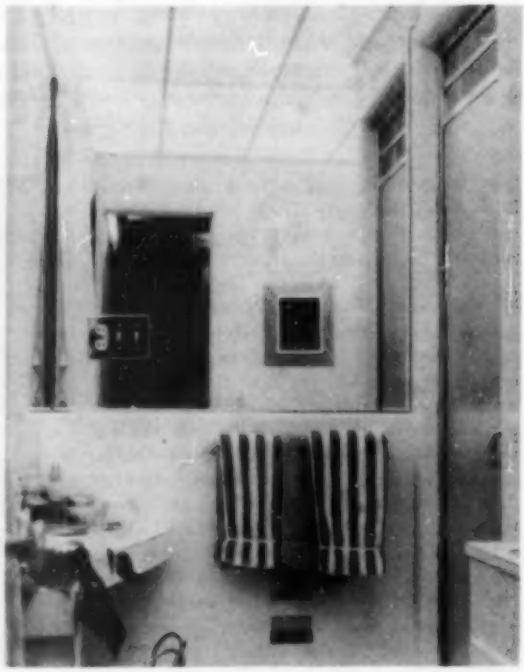
Mr. Shemitz is President of C. S. Mersick Electric Supply Corp., West Haven, Conn.

FIRST PRIZE
CLASS I

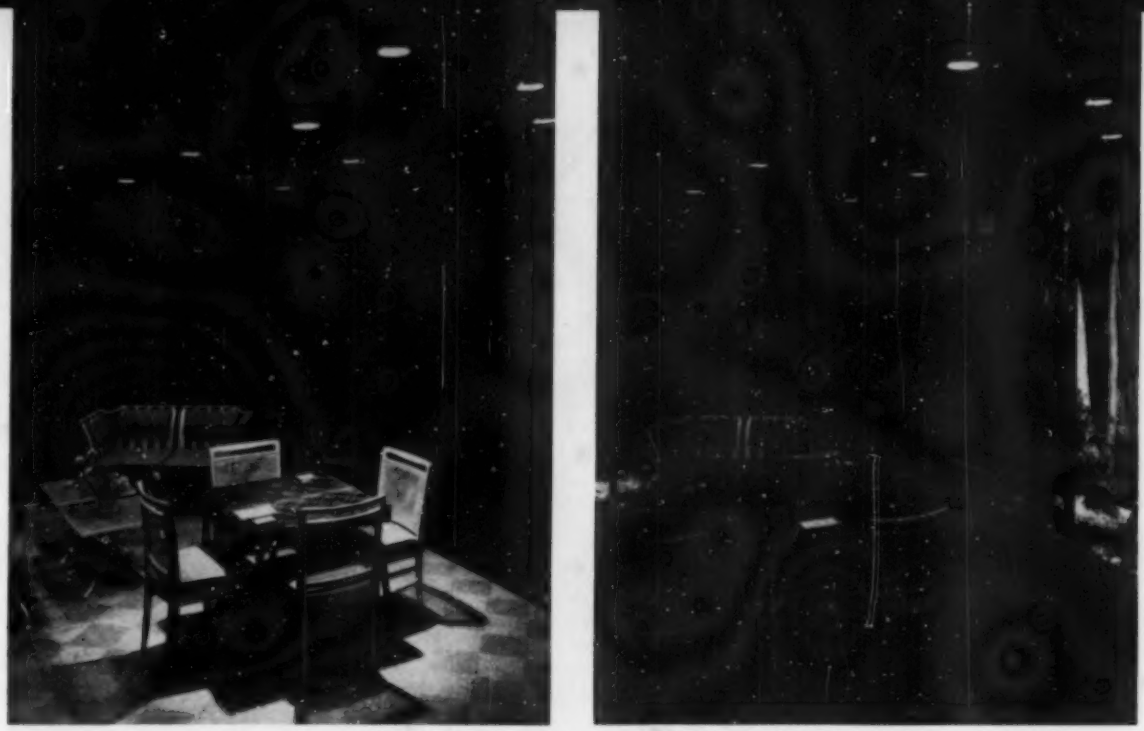
Basic exterior lighting is from nine 75-watt R30 floods in matte black louvered "high hat" units which accent the overhanging roof and emphasize the texture of the wood. Two 75-watt PAR floods in angled louvered eyeball units bounce light off the white panels into the front yard. Over the planter at the doorway (obscured in this photograph) are two 75-watt R30 floods, one of which is independently switched to serve as a nighttime guide light. With only the exterior lighting turned on, it is impossible to see beyond plate glass panels at right of doorway because of reflected images. However, with addition of 75-watt PAR flood in a baffled unit inside the window, reflections are eliminated and interior becomes part of view. From inside, with only exterior lighting in use, doorway planter is seen as an element of interior decor.

Living room lighting design (right and below) employs recessed 75-watt R30 baffled downlights with 45-degree shielding, a fluorescent cove on the wall between living room and kitchen/dining area and an over-drapery valance. On picture wall (photo below) 150-watt R40 floods in baffled units with shovels produce an even distribution of light with scallop effect almost completely eliminated. With all equipment energized, lighting level measures 25 footcandles at any point in the room.

Variation and flexibility from six dimmers and 25 switches keynote living room lighting. Draperies can be front-lighted by interior downlights or back-lighted by high hats in exterior roof overhang. With wall washing units eliminated, central downlights dimmed and bank of six exterior 150-watt PAR floods in use, trees are effectively modeled for beautiful view. Colored valance lighting over white draperies creates subtle background moods. Valance uses 48 lamps, on six-inch centers, in repeating pattern of blue, ruby and yellow. Lamps are controlled by three dimmers. White acrylic plastic over valance acts as diffuser for uplight, reflector for downlight.



For proper spacing ratio in the master bathroom luminous ceiling, lamps were mounted across exposed ceiling joists, painted flat white, a raised box built into attic to act as the plenum. With prismatic louver shielding material in place the luminous ceiling provides 50 footcandles of comfortable, shadowless, general illumination. Supplementary lighting for color correction over the makeup area is from four 75-watt R30 floods in open beam lights. For shaving, a two-lamp 40-watt unit, in combination with the luminous ceiling, provides 54 footcandles vertical on the face. Two 40-watt T10 reflector lamps in an open twin socket under the makeup counter give localized lighting for pedicures. Finally, a sunlamp is recessed over the sink for the daily benefit of ultraviolet rays.



Maximum use of dimming equipment and highly reflective aluminum screening permits interesting variations of the porch lighting—a PAR flood in the center and 13 randomly spaced 75-watt R30 floods. When lighting is at full lamp output (left), reflective screening acts as a scrim, shielding the porch from exterior view. With interior lighting dimmed and eight 150-watt PAR 38 floods on the roof facia in use, the daytime effect of a porch set in the landscape is recaptured.

Fluorescent sources (40-watt warm white deluxe lamps in a valance/cove) for general lighting and high efficiency combined with incandescent (recessed 75-watt PAR floods) for good color rendition make kitchen/dining area into pleasant work space. Average maintained illumination level is 40 footcandles with 50 footcandles on the food preparation counter.

SECOND PRIZE
CLASS I

Bathroom lighting at full tilt generates 34,000 lumens, to 150 fc in 10- by 12-foot room. Maximum brightnesses average only 300 fL.

Lighting Versus

PSYCHOLOGICAL effects of lighting, so ably expounded by the Panel in Print in August IE, should not be regarded as having the *same* effect on *all* people. In this home, the lighting design has been wedded to the dynamics of its two occupants—two people with quite different psychic "paces." Both were very lighting conscious, both very color conscious. Both knew what lighting effects could do and what results they expected. But both expected different results! This from a single lighting system.

Certainly this is an interesting approach to a lighting plan. In this home, it was carried out with unusual empathy, and with a most rewarding result. To plan a lighting system to be psychologically compatible for both people, it had to be considered that "Type A" leaps out of bed early in the morning, whistles or sings his way through his shower, turns up the radio for music, news and noise, and generally enjoys the morning weather, whatever it may be. For "Type B," the top of the morning is the slow part of her day. She likes things calmer and quieter then, and is in no rush to get going. Of course, slower-starting "B" is still going strong later that evening, probably starting some new project at 11 p.m., when "A" is just about out of gas or already retired.

In the design of the entire electrical installation in a new bedroom wing, consideration was given to this difference in pace, to their different living habits, and even to the difference in metabolisms. For instance, "A" is nearly always warm in temperatures quite comfortable for "B." Zoning of various rooms and areas by separate thermostats takes care of a portion of this problem. There are five separate thermostats inside this area and one outside to control various heating zones. So far,

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At 40 per cent of total output with only deluxe cool white lamps in use, lighting level is 40 footcandles.

White fluorescent lighting level is raised to 75 fc and mixed with other colors for interesting effects.

Personal Dynamics

the application has been made only to the kitchen-eating area, and the bedroom-bath area, as the two major living spaces for both Type A and Type B.

Multiple-Shift Bath

The new bedroom-bathroom-dressing room wing offered several intriguing possibilities concerning the differences in the personal dynamics of the two people. Bathroom lighting is a marvel of flexibility. Numerous shifts in color, lighting levels and effects can be obtained by the flick of one of the bank of switches. The view on the facing page is at 6 a.m., switched to the hilt to give "A" an early-morning blast of light. There are 34,000 total lumens generated in this condition (to 150 fc in the 10- by 12-foot room), but careful choice of equipment and materials makes it visually comfortable. Maximum brightnesses average only 300 fL.

For numerous other levels, colors and effects, the ceiling has a carefully selected variety of sources. There are nine 40-watt rapid-start deluxe cool white fluorescent lamps, four 100-watt pink-white incandescent lamps, four 100-watt yellow-gold incandescent lamps and four 150-watt rose-coral incandescent lamps. "A" turns it all on, but the multiple switching arrangement and an auto-transformer type dimmer permits a wide choice of combinations in both color and lighting level.

Diffusing medium for this multiple-source ceiling is ⅜-inch-thick water clear double prism cast acrylic plastic in 24-inch squares in an extruded, striated Alzak aluminum T-Bar grid. Careful treatment in finishing the plenum was considered vital. The 12-inch depth and 24-inch spacing between fluorescent lamps directly over the T-Bars and four inches from the side walls along with the rather large number of incandescent lamps could have resulted in objectionable lamp images and shadows.

Photo at left, above shows a stage at about 40 per cent of total output, using the deluxe cool white fluorescent lamps. Illumination at this stage is 40 footcandles. Lamp images just start to appear at this reduced level, and the color is efficient in the warmer end of the spectrum. Colored slides could demonstrate, better than words or pictures, the several complete color shifts accomplished by switching on, say, pink-white and yellow-gold sources, and by raising the base white fluorescent level to 75 footcandles (at right, above). Several choices are possible, and the entire atmosphere of the room can be altered.

Loggia view of the bedroom showing valance.

Bedroom Lighting, Patio Heating

The more conventional portions of the bedroom were treated somewhat conventionally, but with a two-step reduced voltage switching. Recessed dropped opal lens units with 150-watt standard incandescent lamps are used in the halls; surface mounted units, also with 150-watt lamps, are inside the closets. Both provide two levels of illumination. Viewing angles, the chief problem here, were carefully analyzed to permit continued activity (into the closets, etc.) by the still active member, with the other already retired.

Fig. 4 is the loggia view of the bed-sitting room. A deep valance, 12 inches high, is designed to continue these shielding angles and to wash walls and perimeter furniture with background lighting only. Two-lamp strips were used, the lamps being brought out the maximum distance of eight inches from the wall to a point well ahead of the vertical edge of the neutral draperies (70 per cent reflectance). Runs are separately switched. Back of the valance boards are finished in a flat white of 80 per cent reflectance. The textured ceiling is nearly the same (.75 RF) with somewhat darker walls (.55 RF). This creates the desired result of general lighting near the window walls *only*, with approximately 30 footcandles at the chairs. (Bookcase headboards and the bed are separately treated with portable lamps.)

A total of 8 four-foot, two-lamp fixtures are used in the illuminated valance, chosen only after considerable research in color and color effects. One complete row of deluxe cool white rapid-start lamps was installed, with each lamp enclosed in a tube of double thickness theatrical gelatine No. 163, blue smoke. Ths permits a complete shift in color and intensity. The color effect obtained is the result of several calculations and experimentation with gelatines of a wide variety of thicknesses and colors.

Concealed behind the valance board is an optical device consisting of a cylinder eight inches long and having a diameter of two inches, with a lens and reflector, controlling the output of a 56-watt A-21 railway lamp to focus a pool of light on the foliage on the cocktail table. Color combinations are flexible but in this particular switching arrangement, three kinds of "light play" might be said to be achieved:

(a) Focal glow or pools of light.
(b) Ambient luminescence or reflected light.
(c) Play of brilliants as on the foliage.

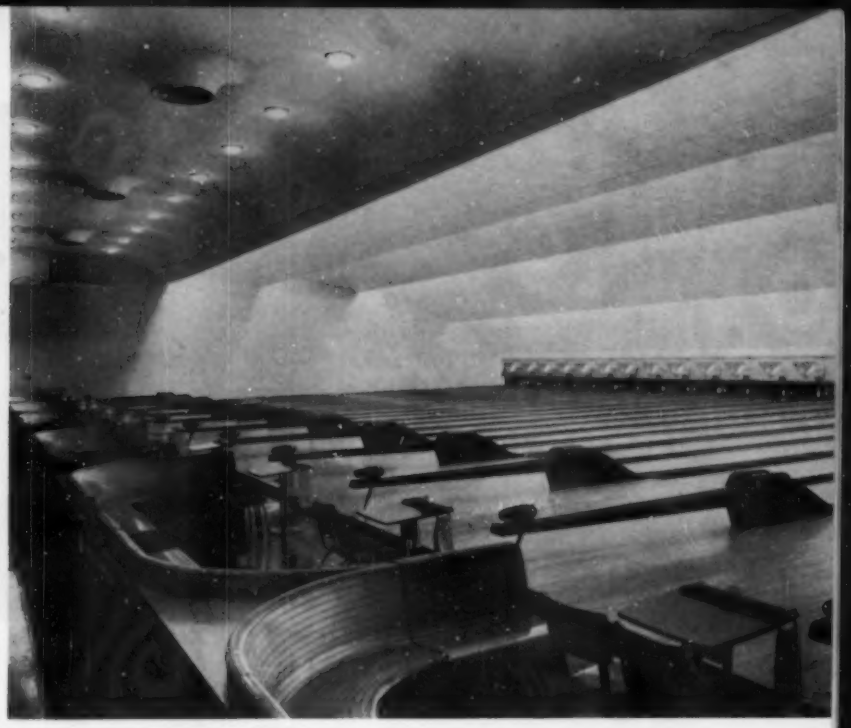
The careful shielding allows optional use of the draperies; open or closed, the room is attractive. The recreation room visible through the glass doors and this bedroom itself thus are able to complement one another, and a variety of garden and grounds lighting further extends them visually. This is the effect most enjoyed by "B" in this house, but both members of the family do have a choice of quantity, quality and appropriate color when using this room for a late snack, watching TV, or just reading in this combination bedroom-sitting room.

Relevant personal dynamics for the patio were the different metabolisms of the two people. "A" with a plus metabolism felt the heat but not the cold, while "B" was easily chilled. Local heating for evening coffee out-of-doors was provided by 250-watt standard light inside-frost infrared heat lamps recessed in the overhead and equipped with special heat-resistant louvers. This was supplemented by radiant heat from lead sheath cable cast in one zone of the patio slab. An inside switch with pilot light and an outside thermostat with a capillary tube cast into the slab itself permit a portion of the covered patio to be radiantly heated up to 120F surface temperature to please "B," while "A" can sit alongside on an unheated portion and be quite comfortable.

These unusually personalized design techniques, slated eventually to be applied throughout the house, have very successfully satisfied the needs of two people having very different living and working schedules and even different metabolisms. Particularly noteworthy is the bathroom lighting which is able to please two widely different temperaments, all from a single system. What was not anticipated here, but is no doubt enjoyed, is the stimulation derived from *change* itself.

SECOND PRIZE

CLASS II



Science and Art

FOR A BOWLING ALLEY

FOR ITS BEST application, illuminating engineering must often be both science and art. Certainly both are evident in the relighting of the Amherst Bowling Lanes in Buffalo, New York. Artful engineering was required especially for the structural problems encountered.

In the "before" situation, topflight bowlers who use this 24-lane alley were quitting in despair of almost ludicrous conditions. The center alleys were especially frustrating. Here a dim six footcandles lighted the approach, and the spotty illumination down the lanes averaged 15 footcandles. Side alleys, more recently built, were not much better. Equally annoying was the maintenance procedure for the 500-watt enclosed floodlights. This had to be done by two men with a 20-foot aluminum ladder which straddled four lanes. What's more, since even one burnout so reduced the light as to produce a rash of missed spares, most bowlers demanded relamping on the spot. The din, amplified by the funnel effect of the high, curved plaster ceiling, was just grimly accepted.

This same ceiling shape was a major problem in the relighting design. The problem was further complicated when the management insisted that under no circumstances could the ceiling be lowered. The balcony at the back held 200 paying customers, and many big tournaments were scheduled.

Conventional equipment using T12 430-ma lamps had to be ruled out for this 20-foot ceiling. Preliminary calculations indicated that it would take ten to twelve rows of such equipment to produce

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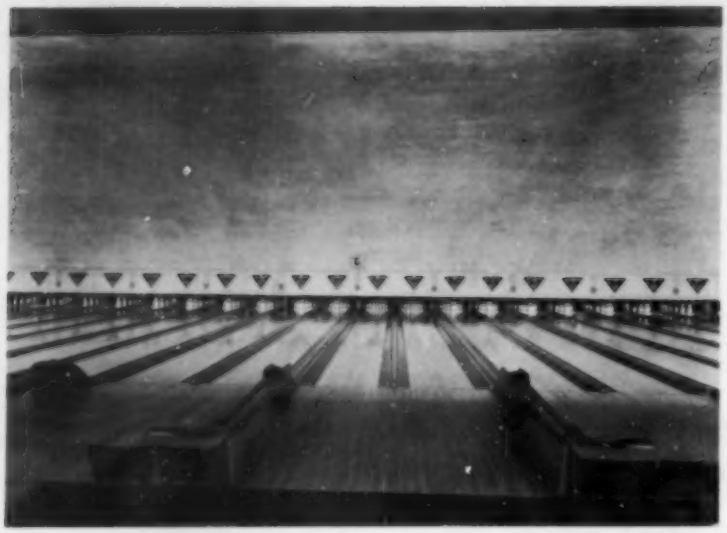

BEFORE relighting, spotty illumination down lanes averaged 15 footcandles with 6 footcandles at approaches.

the 100 footcandles requested by the management. The circumstances seemed ideal for the application of the new 1500-ma lamps.

Because of the irregular shape of the ceiling, the usual area method of determining the number of fixtures required could not be used. Instead, the more difficult point-by-point method had to be used to achieve the evenness of light distribution along the entire 60 feet of the alleys. This uniformity was extremely important. In fact, engineering calculations to predetermine evenness of distribution on the lanes were the only way to establish where each row of fluorescent lamps should be located and what degree from horizontal they should be tilted. The lighting recommendations had to be worked out precisely and carried out with equal precision. This included specifying 800-ma lamps in the fourth row rather than 1500-ma, to maintain uniformity and avoid wall brightness in line of vision.

End result of this engineered installation, however, is one of the most outstanding examples of bowling alley lighting in the country. Some of the statistics:

Head pin is lighted to 160 footcandles; lighting levels are 135 footcandles average over the alleys, entirely free from direct and reflected glare; approaches have 31 footcandles. From nine feet past the foul line, the footcandle level on the lanes does not vary by more than five footcandles over the remaining 51 feet of the lanes. Reflectances are: ceiling, 80 per cent; walls, 50 per cent; floor, 15 per cent. Balcony view is entirely unobstructed and the sawtooth ceiling construction breaks up the sound waves, improving acoustics.

AFTER relighting average illumination on lanes is 135 footcandles with 31 footcandles at approaches, 160 on the head pin. This view shows tilt of 1500-ma lamps in sawtooth ceiling.

Low-Budget Restaurant Lighting

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Bluenose Chapter
Canadian Region

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THIRD PRIZE
CLASS II

THE USUAL problems inherent in low-budget lighting are further complicated in a restaurant, where an individualized atmosphere is the ultimate goal. One solution to this problem, the use of color in light sources and fixtures, was successfully demonstrated at the Flamingo Restaurant in Halifax where, on a $2000 budget, lighting was designed to fulfill the owner's desire for a "crisp, refreshing" atmosphere.

Daylight fluorescent lamps used in combination with ice blue paint in coves, cool green fluorescent lamps to highlight planters, flame tint lamps in a chandelier and coral-colored decorative units formed the color palette for the design. Incandescent lighting from recessed eyeball units, "pot" lights and decorative units, provided the necessary footcandle levels and maintained the over-all color of the installation in the red end of the spectrum for proper rendition of food and complexions.

At the front of the restaurant, following the contour of the glass facade coral glass fixtures with 100-watt incandescent lamps are suspended 48 inches from the ceiling for decorative effect. Just inside the entrance are five two-foot square indirect louvered fixtures with 200-watt silver-bowl

Counter Area

Dining Room

Banquet Room

lamps, which, with the decorative units, provide 25 footcandles maintained on the tables.

Over the counter area, white glass units with black stripes, similar in design to the coral fixtures at the front of the restaurant, strike a coordinate decorative note. Functional lighting in the work area behind the counter is from "pot lights" with dropped brass perforated sides, recessed in a scalloped canopy. Booths along a side wall are illuminated by the reflected light from 75-watt reflector floods in recessed eyeball units angled toward the wall. The directional lighting emphasizes the wall decorations and avoids direct glare on the table tops.

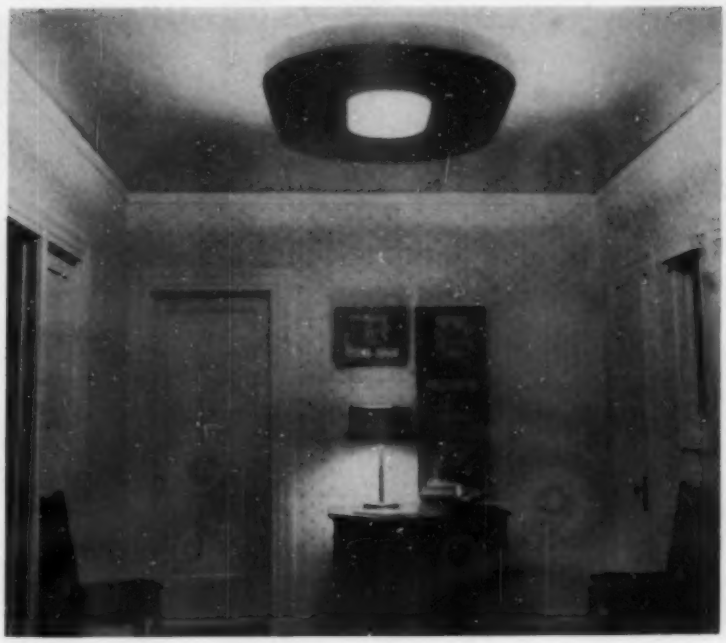
For effective separation of the dining room and counter area, the dining room ceiling is lowered 18 inches below the main ceiling line and a room divider with planter placed at the juncture of the two areas. The dropped ceiling (recommended by the lighting designer) not only creates an architectural division but accommodates the cove lighting which accentuates this division. Back wall of the cove is painted ice blue and daylight fluorescent lamps used to create a "cool" atmosphere. In the planter/room divider beneath the cove, green fluorescent lamps in recessed strip units, emphasizing plant color, add another cool tone to the spectrum.

The basic principle applied to the dining room lighting required well-lighted walls for an illusion of spaciousness with dependence upon reflected light for the tables and booths. This is accomplished with 75-watt reflector floods in eyeball units aimed at the side walls. "Pot lights" recessed in the ceiling give additional illumination in traffic areas; a cove along the rear wall introduces the cool color note.

For dramatic emphasis on a planter in the center of the dining room, a chandelier with 25-watt flame tint lamps is suspended from a nine-foot diameter well recessed in the ceiling. Again, in the planter, cool green fluorescent lamps are used to intensify the color of the foliage. Blue and coral upholstery on booths and counter seats is coordinated with the colors in the lighting design.

Banquet room lighting is a combination of recessed "pot lights" with colored lamps, two-foot square recessed indirect units with 200-watt silver-bowl lamps and perimeter cove lighting from daylight lamps reflecting off an ice blue background. With all fixtures in use, maintained lighting level is 20 footcandles. "Pot lights" alone provide low-level illumination for dances. Especially in this basement room, where mahogany panelling and windowless walls had an innately depressing effect, the cool light from the coves creates a pleasant atmosphere on warm evenings and at crowded parties.

THIRD PRIZE
CLASS I



This attractive "fixture" is of plywood suspended over existing four-inch fixture which previously lighted entrance hall of this fifty-year-old home. Fluorescent strips concealed in unit and higher wattage lamp in old fixture boost lighting levels.

Remodeled Lighting—Without Rewiring

EXTENSIVE rewiring of an old home may, often as not, be the chief deterrent to relighting. This ingenious installation has solved this problem with a lighting layout which requires, by design, little if any rewiring. At the same time it gives character to the surroundings and its comfortable "lived-in" furnishings.

This plan begins right with the entrance hall, a spacious, almost square (12 feet by 15 feet) space so typical of homes of this age—fifty years. Also typical, before remodeling, was the tiny four-inch fixture and its 60-watt lamp. Its effect barely dispelled the darkness.

With no additional wiring or switching, this condition has been changed (see photo above) by a "fixture" which is simply a ⅝-inch piece of plywood cut to a three-by-five-foot oval, with a smaller oval cut from the center. Diffusing glass was inserted in this opening. The whole unit is suspended from the nine-foot ceiling, superimposed over the old fixture. This, however, is now lamped with a 75-watt bulb to punch light down through the diffusing glass. In addition, two four-foot fluorescent strips have been laid on top of the panel with the tubes facing the ceiling. The edges of the panel are grooved on top to hold a two-inch strip of plastic which conceals the channel from view. The whole ceiling is very effectively lighted, reflecting light back into the hall. Simple, inexpensive, effective—and attractive.

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Golden Gate Section
South Pacific Coast Region

Mr. Haskell is a residential lighting specialist with Pacific Gas and Electric Co., San Francisco, Calif.

Living Room

As was the custom years ago, the living room was wired for a center fixture. For remodeled lighting, this fixture box has been topped, and the outlet relocated at the wall. This, of course, required little extra rewiring, and used the same switch.

The fireplace end of the room has an ingenious

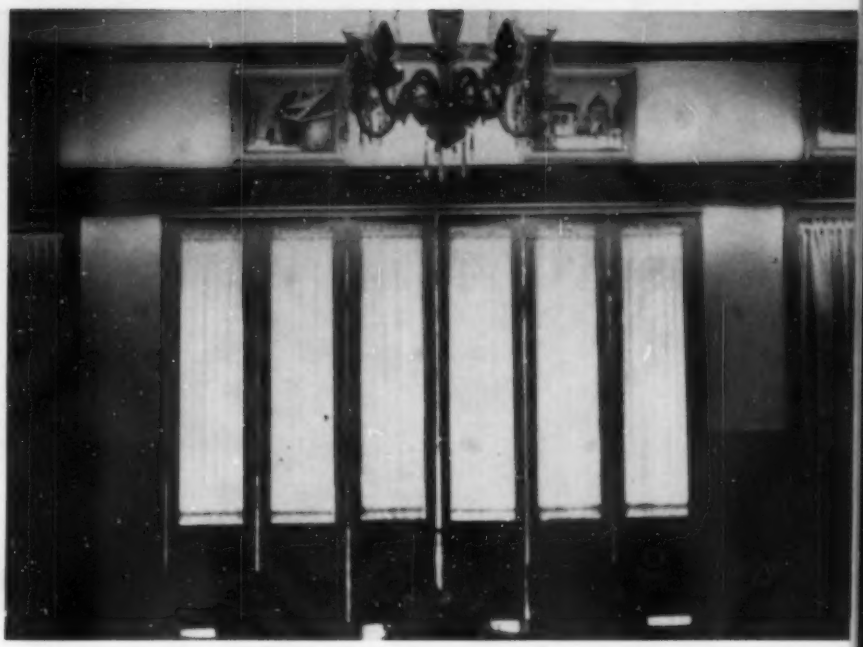
False beams on either side of the arch form a housing for shielded fluorescent strips facing the bookshelves. An interesting "picture frame" effect at fireplace area is created.

design which creates a lighted "picture frame" effect for this area (see photo above). The original problem was to light the area on the far side of the beam. The simple solution of locating lamps behind this beam near the ceiling was not practical, it so happened. Instead — keeping in mind that cost was a prime objective—four-foot fluorescent strips were mounted vertically on the wall on either side of the arch, from floor to beam. These were boxed in on three sides to give the effect of pillars supporting the beam. The open side facing the bookshelves holds a plastic diffuser. "Illuminated beams" were plugged into baseboard receptacles and switched. Again, no wiring required.

Notice the tiny decorative lighting effect behind candles on the mantel. This is simply a night light plugged into the existing mantel outlet.

The other end of the living room was completely glazed, leaving no functional wall space. Further, the molding design was part of the ceiling. Lighting this area without portable lamps was quite a challenge. Here is how it was done: A four-foot rapid-start fluorescent strip was mounted vertically in the corners of the room, running from the top of the bench table to the ceiling. A diffusing plastic panel shielded this, and bridged the corner (see photo below). This was held in place by molding strips top and bottom. The "fixture" was plugged

A large bay window has been used to provide general nighttime lighting and decorative effect. Four-foot fluorescent strips mounted vertically in the corner are shielded by plastic diffusers bridging the corner.



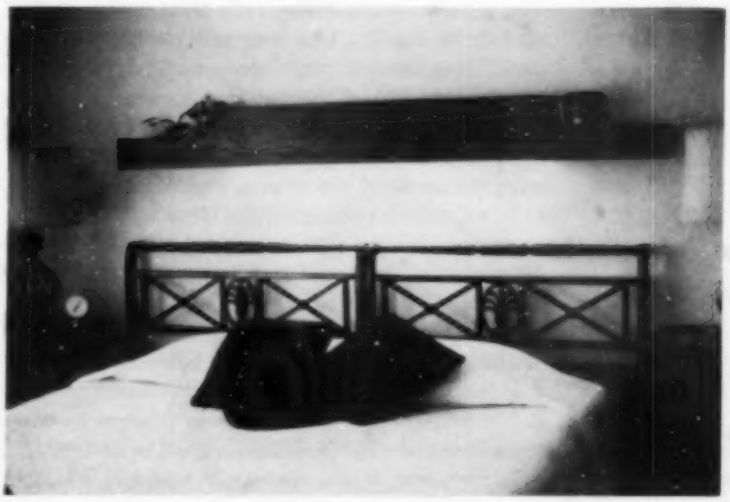
In the dining room, a wall-to-wall bracket washes the walls with uplight to display pictures, provides downlight for general illumination. Luminous closet doors are decorative when closed, provide functional lighting inside closets.

into an existing convenience outlet and a switch placed in the line beneath the bottom molding. The interesting effect thus created in this window bay also provided adequate general lighting, using existing wiring with just a switch added.

Dining Room

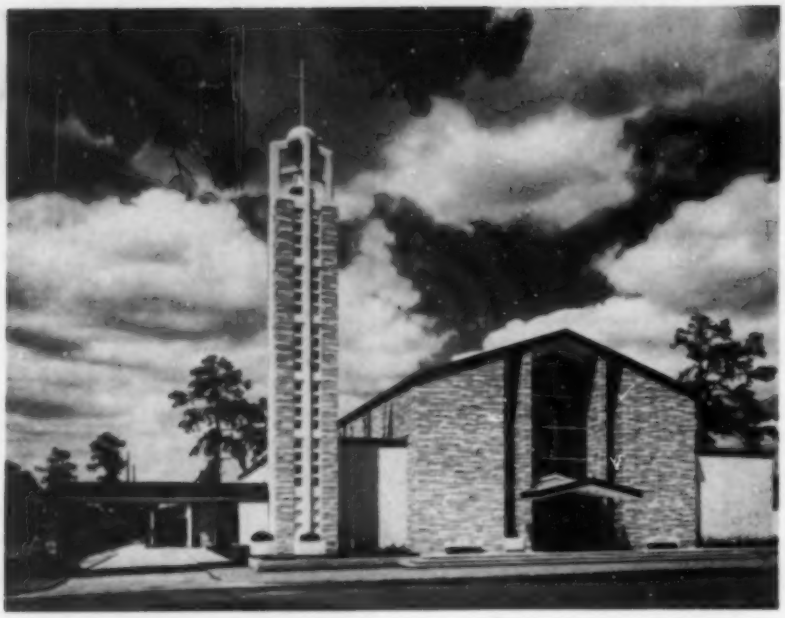
Prior to remodeling, the entire illumination in the dining room, what there was of it, was from a conventional crystal chandelier. What was obviously needed in the room was more over-all lighting and some decorative lighting for the pictures. See photo above for the solution: A wall-to-wall bracket forms a valance "wall washer" both upward onto the pictures and downward over the walls. A most attractive feature is the luminous closet doors. This provides not only an unusual decorative effect but very functional illumination within the closets when the doors are opened. As to the wiring for this remodeled lighting, a wall sconce previously located between the closets was raised approximately 14 inches and the new bracket tied into the relocated outlet.

Other areas in the house, for example, the bedroom shown below, were similarly relighted with maximum imagination and minimum rewiring.



In bedroom, wall bracket and dimmer-controlled portable lamps provide lighting at the bed. There are 30 footcandles for reading from the wall bracket alone. In addition, valance lighting over the windows gives general illumination.

FOURTH PRIZE
CLASS II



NEW LIFE FOR

ADVOCATES of incandescent lighting for churches, faced with the limitations of their sources in achieving the higher footcandle levels, might well take note of the lighting design in Houston's St. Theresa's Church. Here, fluorescent lighting, a luminous ceiling in particular, is so successfully integrated with the church architecture that even the most skeptical must be convinced that higher footcandles are possible without grievous esthetic consequences.

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San Jacinto Section
Southwestern Region

Mr. Price is Chief Engineer for Golemon & Rolfe, Architects and Engineers, Houston, Texas.

The luminous ceiling over the altar and sanctuary creates a focal point with light and, at the same time, provides 75 footcandles of illumination. The ceiling, which follows the line of the pitched roof is 38 by 8½ feet and uses 96-inch slimline super deluxe cool white lamps. The lamps are mounted on 12-inch centers and shielded by corrugated Plexiglas. Alternate switching arrangement permits a variation in lighting levels in accordance with the needs of the church service.

For special emphasis on the altar and the mosaic panel of the Paschal Lamb behind it, a tester lamped with twelve 300-watt spots is suspended two-and-a-half feet below the luminous ceiling. This increases the range of lighting levels available on the altar, permitting variation between 25 and 75 footcandles.

Nave lighting is indirect, from fluorescent coves with banks of eight continuous rows of 96-inch T12 slimline super deluxe cool white lamps mounted on

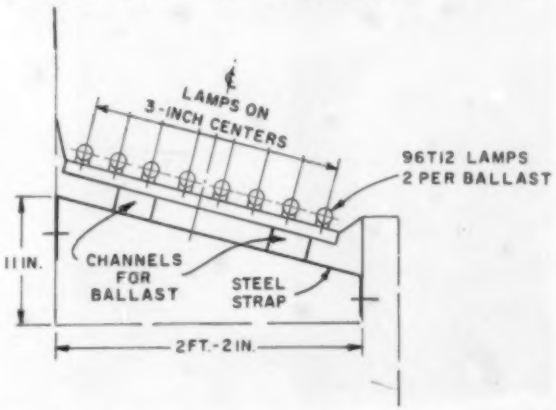
LUMINOUS CEILING

three-inch centers (see drawing). A total of 176 lamps are used in the coves. Ballasts are 277-volt 60-cycle with two lamps wired to each ballast. For maximum utilization of light output, the cove is equipped with a reflector having a baked white enamel finish. Two additional coves, each five by 60 feet, are used in the lower alcoves on each side of the nave. An alternate switching arrangement makes nave lighting variable from six to 25 footcandles, in four steps.

Relief lighting on the statuary and the stations of the cross is from 150-watt R40 adjustable spots. A statue of St. Joseph on the side altar is displayed by three 150-watt PAR38 spots. Additional spots over the main door, hidden from view by the balcony, illuminate the central stained glass window and the interior stone columns. For added exterior interest, three 150-watt PAR spots in each of the planters at the side of the main entrance are aimed at the stained glass windows flanking the front door.

Interior reflectances are ceiling, 76 per cent; walls, 20 per cent; floor, 35 per cent. Church exterior is a combination of random ashlar stone and face brick with stone grillework on the bell tower and an aluminum cross. Bell tower is floodlighted to 100 footcandles.

Architects for the church were Golemon and Rolfe, Architects and Engineers, Houston. Pastor is the Reverend Ralph J. Diefenbach.



Detail of fluorescent cove in nave.

FOURTH PRIZE
CLASS I

Structural Lighting

THE ADVANTAGES of structural lighting in homes—for higher footcandle levels and decorative effects—have been so often demonstrated that good residential lighting design must, almost by definition, include some structural elements. In fact, residential lighting designs with *no* portable lamps are often found to be desirable, as in the living and dining rooms of this 30-year-old remodeled house in Cleveland Heights, Ohio.

In the living room, the furniture arrangement dictated the lighting design. With sectional sofas arranged along two walls of the room, it was impossible to position portable lamps for either adequate general illumination or localized lighting for specific seeing tasks. In contrast, a structural lighting technique—the valance—was an ideal method for providing general illumination.

The valance installation is in two parts, a corner section over the sofas composed of an eight-foot length on a side wall and a 12-foot length on the end wall, and another eight-foot section across the room. The valance uses eight-foot high-output deluxe warm white lamps with ballasts remotely lo-

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Great Lakes Region

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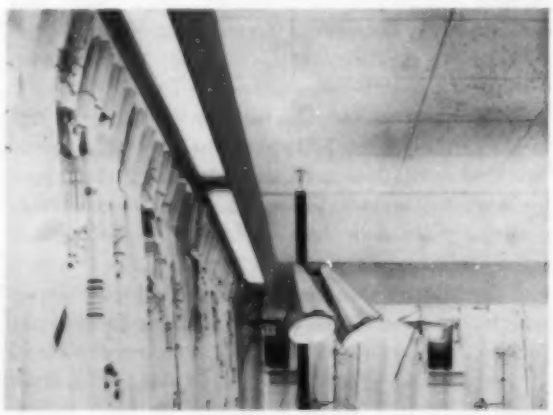


View of underside of valance. Note small cross section aluminum louvers used to direct light output.

cated in the basement for weight reduction and noise control. To minimize any excessive brightness from the high-output lamps, the valance faceboard is mounted nine inches from the wall, the lamps installed as high as possible behind the board and small cross section aluminum louvers clipped to the bottom of each channel to direct light away from the upper inches of the draperies.

At full light output, the valance provides 25 fc on two corner positions of the sofa and 15 fc on a chair in front of the eight-foot section.

For variation in lighting effects, the valance is wired to a non-standard dimming circuit using a variable reactance control. Dimming provides stable operation over a 6-to-1 range of illumination, permitting interesting low-key effects.

Against this background of valance lighting, a specially designed short pole lamp and a wall-mounted adjustable unit are used fo provide higher levels of illumination for prolonged seeing tasks. The pole lamp, attached to a corner table between the sofa sections, has two louvered PAR38 lamp housings, mounted at the same height, to direct light onto the corners of the sofa from approximately the same angle as a well-placed portable. (The candlepower distribution of the 75-watt PAR-38 lamp was better suited to the illumination prob-

For High Levels

lem than the distribution of either the 75-watt R30 spot or flood.) In combination with the valance, the pole lamp provides 80 footcandles for reading. The adjustable PAR38 wall-mounted unit across the room gives 70 fc in another reading area.

Dining Room

In the dining room, there were two specialized lighting problems — a window wall between two built-in storage units and the telephone area. (A previously installed ceiling fixture with glass diffusing bowl provided general lighting from four 60-watt lamps and a downlighting accent on the dining table from a 75-watt PAR38 flood.)

For illumination on the draperies and a sill-height buffet shelf along the window wall, a cornice was constructed between the two storage units. Cornice faceboard is attached to the ceiling, 16 inches from the wall with the front surface flush with the storage units. Two 3-foot channels mounted end-to-end on the ceiling, behind the faceboard, house 30-watt T12 warm white deluxe lamps. Specular aluminum foil surface on the inside of the faceboard increases the energy directed toward the lower part of the draperies and provides evenly distributed illumination along the length of the fabric. Compared with a flat white finish, the foil lining yields 10 per cent lower illumination on the center line of the draperies at the ceiling and 50 per cent higher illumination three feet below the ceiling, a distribution which produces a strong vertical component and aids considerably in "enlarging" the dining room when only the central downlight is in use.

Thirty footcandles of localized lighting for the telephone area are obtained from a louvered wall bracket with a 30-watt R20 lamp mounted two feet above the telephone stand.

Louvered wall bracket provides 30 footcandles of lighting at the telephone stand.

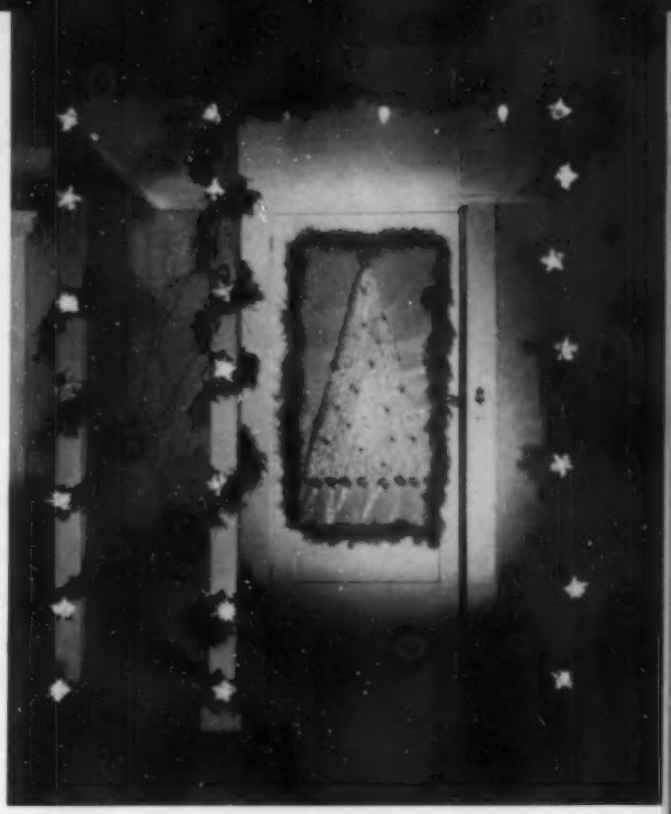
Warm yellow light gleams from the lanterns and the roping across the roofline, and through the silver-white branches bordering the door. Ready-made plastic bells are in red; white light accents the faces of the caroler figures; the entire composition is "washed" by the light of two red floodlamps.

CHRISTMAS IDEAS . . .

A DECORATED doorway is the keynote of holiday hospitality. After the decorating is done, even if small Christmas-tree-type light sources are used in the decorative design, shine flood- or spotlights on the doorway so that no detail is lost at night. Then your colorful and gaily-lighted entrance will radiate holiday cheer, saying to friend and stranger alike—*Merry Christmas.*

A spotlight accents the blue-robed angel design on the gold-covered door; three spots inside the window illuminate "Noel" done in gold roping on a red velvet backdrop; a gleaming star completes the composition. All are floodlighted from the lawn.

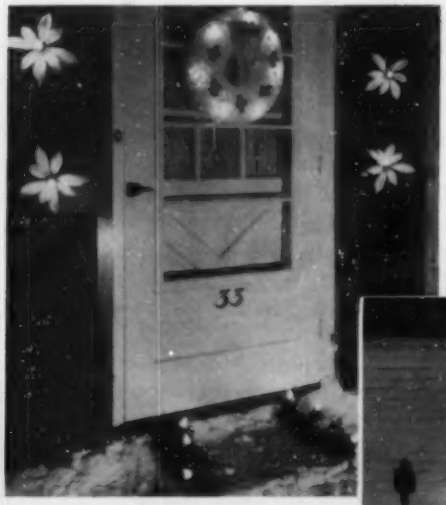
Christmas-tree shapes cut from plywood, sprayed green and drilled with holes for outdoor-type bulbs which project through from the back, are "planted" in huge, bright red flower pots set on the porch above the garage. All are floodlighted from below.



Evergreen roping studded with lights backed by tinfoil stars decorate the pillars of this house. The tree design on the door, made of tinsel roping basted to a red oilcloth background, is decorated with green ornaments and framed by an evergreen border. The display is spotlighted from the walk.

FOR LIGHTED DOORS

By MYRTLE FAHSBENDER



Lollipops delight the small fry. Wooden discs are drilled to permit small red bulbs to peek through the red spiral on the small lollipop and green bulbs to appear through the green spiral of the larger one. Multicolored lights in laurel roping around the door and a floodlamp on the lawn highlight the entire entrance of this house.

Outdoor Christmas bulbs have been added to the white wreath (at right, above) and plastic poinsettias and to the green plastic laurel that borders the doormat. A spotlight provides desired accent.

Giant wreath of pine branches decorated with small flashing bulbs, gold bells, red oilcloth poinsettias and a large bow, forms a circle around the door. Floodlighting highlights the ornamented facade.

AUTHOR: Director, Residential Lighting, Westinghouse Lamp Division, Bloomfield, N. J.

Lighting . . . Keyed to Today's Homes

CHAPTER II

Ceiling and Wall Fixtures

This is the second installment of a three-part report. The first part was published in the October ILLUMINATING ENGINEERING; the third installment will appear in the December issue.

In recent years ceiling and wall fixtures have undergone marked improvements in lighting performance, appearance, and application. A better technical understanding of light source development and equipment designing has made possible lighting quantities and qualities which are in keeping with the seeing requirements for today's living. These new fixtures are in better scale and proportion to interiors, furnishings and people.

The coordination that can now be achieved between living activities, related furnishings and architectural features has revolutionized former ideas about fixture selection and installation. No longer is the center of the ceiling the only location for a fixture, nor is the fireplace wall the only spot for brackets. Forethought in planning, relative to the purposes, activities and required furnishings of the interior, makes the installation of more than a single fixture both logical and appropriate. See Fig. 77.

INCANDESCENT TYPES

Horizontal mobility has been attained by the use of electrified ceiling tracks, surface-mounted or recessed, to which fixtures may be attached. For local lighting at tables or chairs, or for activities requiring rearrangement of furnishings, a reel-type fixture on a ceiling track gives choice of position and location (Fig. 78). A pulley reel incorporated in suspension cord adds vertical flexibility.

In many cases a fixture suspended from the ceiling over furniture groupings in living areas or bedrooms solves problems of space utilization. See Figs. 79, 80 and 81. Hard-to-light areas, such as serving cabinet furniture, planter dividers, or island tables, can be lighted by fixtures that also

Figure 77. A pleasing coordination of decorative pierced wall brackets and pulley fixture in brass, recessed ceiling units, and pole lamp to provide both functional and accent lighting.

Figure 78 (left, above). Lighting for games is provided by the fixture in the position shown. When the table is located in the center of the room the fixture is moved across the ceiling track to the table location.

Figure 79 (left). Twin open-top pulley fixtures provide some upward illumination as well as diffused downward light. Light-colored table top and rug reflect light into room from the unit recessed in the ceiling.

Figure 80 (above). The reel-type fixture lighting this furniture grouping is used in conjunction with cornice lighting which reflects light into the area from the bamboo shades.

Figure 81. Light for reading in bed is provided by pulley fixtures over the end tables. Fixtures of white opal glass cylinders over the dresser and diffusing glass wall brackets in dressing room supply general lighting as well as light for grooming at the two mirrors.

Figure 82. This custom-designed fixture provides indirect fluorescent lighting and incandescent accent downlighting from matching decorative brass units over the planter divider. Photograph by Will Thompson.

Figure 83. Three pierced brass downlights over light-colored top on island table serve to provide illumination for games or snacks.

add to the over-all decorative appeal of an interior. See Figs. 82 and 83.

Neglected locations, such as the fireplace wall, the corner planter or even the piano (see Fig. 56)* can now be illuminated by pleasingly designed surface-mounted or semi-recessed fixtures using reflector or projector bulbs or other control devices. For these locations fixtures are available with adjustable features that make it easier to control the direction of the light beam. See Fig. 84. Self-leveling devices incorporated in the design of ceiling-suspended fixtures also aid in lighting rooms having slanted, peaked or studio-type ceilings. See Fig. 23.*

Figure 84. Adjustable eyeball units accenting the paintings over the fireplace and a cornice installation highlighting the mural wall supplement the traditional chandelier designed with low brightness opal shades.

Wall fixtures have followed the design trends of marked improvement evidenced in the ceiling types, and are often designed for coordination with them. Harmonizing wall fixtures are often used in areas such as entrances, hallways or living porches. See Fig. 85. This is a change from the old idea that they must be used in the same room as the matching ceiling fixture. The open-plan house has influenced this application. Interlocking areas create the desire for coordination in fixture design treatment while at the same time presenting the need for interesting or necessary variation in lighting distributions.

Shallow close-to-ceiling fixtures have become more plentiful for interiors with ceiling heights ranging from 7 feet 6 inches to 8 feet 6 inches. These fixture types have improved in efficiency with the use of bent glass coated with ceramic enamel applied by silk screen processing. They are large in size, ranging from 16 to 22 inches in diameter, or diagonal measurement for the square types. This increase in size allows for the use of three to

*"Lighting . . . Keyed to Today's Homes—Part I," ILLUMINATING ENGINEERING, Vol. LV, No. 10, pages 549 and 537 (October, 1960).

Figure 85. Direct-indirect perforated metal wall brackets in hall are located and directed to produce accent downlighting softened by light reflected from ceiling.

Figure 86. White opal cylinders, in lanterns of colored laminated plastic in which tinted light bulbs are used, add interest and brightness to a furniture grouping.

five bulbs positioned horizontally so that the light is directed toward side walls more effectively than with the single-bulb type.

There are also globes or lanterns of many shapes and materials: glass, plastic and various types of woven substances. These are used singly or in clusters for dramatic effect, giving decorative vertical emphasis and general diffuse illumination. See Figs. 86, 87 and 88.

Today, traditional design holds to classic lines but eliminates over-ornamentation. As a result of this trend, many new delightful chandeliers are appearing on the market. See Fig. 89. They keep the traditional feeling of the multiple light sources but provide lighting effectiveness never obtainable by electrifying candlelight designs. In some cases larger light sources have been used to obtain more light from purely traditional type fixtures. These should be shielded by well proportioned shades that reduce glare and direct more light downward (Fig. 90).

With subtle redesigning, concealed bulbs are sometimes used within these symbolic fixture bodies, or their bobèches, to produce added upward light and to increase the downward light, thereby improving the lighting results directly below the chandelier. The use of many miniature clear bulbs which are in scale with some of the traditional designs will restore the sparkle and gaiety of a bygone era to the chandelier. See Fig. 91. It is unfortunate that these miniature sources in a five-to-eight-light candle-type fixture usually used in dining rooms do not do as much for the room or its occupants. Surroundings appear dingy and the bright bulbs can be glaring. Additional illumination in the room will counteract this effect. One good method is by the use of lighting from cornices or valances, or other methods for lighting window

Figure 87. Cluster of decorated opal glass shades of interesting shape accents end table arrangement and adds diffused illumination to the downlighting.

Figure 88. Metal shades suspended over game table are painted to match wall color. To reduce inner shade brightness, wall color is also applied on inside surface to a depth of three inches. Projecting perforated metal cylinder is matte black to increase visual comfort. Note that direct light fixture is used against a background of reflected light from a wall bracket or cornice.

Figure 89. One example of today's approach to the traditional multiple light fixture. Low brightness plastic shades direct the major portion of the light to the table and are held firmly in position by attachment to the metal socket cover. The six 40-watt bulbs are controlled by a wall dimmer; an adjustable eyeball unit accents the serving counter.

Figure 90. Light bulbs in this candle-style fixture are shielded by decorative shades and controlled by a dimmer for the selection of a desired lighting level. Lamps of good proportion provide light for reading in bed. Interior Designer, Senya B. Troop.

and wall areas. A delightfully luminous atmosphere for entertaining or dining results from the contrast between sparkle from the bare bulbs, to highlight jewelry and table setting (see Fig. 92), and the softening effect of reflected light from large wall areas, to enhance the appearance of people and enliven the colors within the room, as is shown in Fig. 93.

Carefully designed downlight installations with units located in relation to furniture arrangement can be used to provide the additional illumination. When this is done, forethought needs to be given to the selection of high reflectance values for floor and wall surfaces so that the downward light from these units will be reflected upward, reducing the brightness difference between ceiling surface and lighted units, and sidewalls will be softly lighted to define space and give evidence of color and texture. In either case it is best to let the traditional fixture set the key or theme for mood and to rely upon these other methods to supply the actual illumination. See Fig. 95. This follows the current trend in all forms of interior design, which is toward mixing and harmonizing traditional aspects with modern or contemporary styling in the home.

Figure 91. In this expansive entrance foyer fifty small, clear bulbs add glitter to enhance the elegant traditional crystal chandelier and combine with light reflected from the white woodwork and ceiling to produce pleasant, general lighting. Note local illumination on directory at telephone table located under the stairs.

Figure 92. The background lighting for the antique crystal chandelier using small light bulbs is provided by incandescent lens strips which are recessed in decorative cornices on the opposite walls. Interior Designer was Beverly Reitz.

Figure 93. Flexibility in lighting is achieved by a dimmer controlled, eight-light, champagne-colored crystal chandelier and a similarly controlled fluorescent cornice, which reflects light from the champagne-colored draperies. Interior Designer, Senya B. Troop.

Figure 94. A curved stairway winds around this Orrefors crystal chandelier revealing its shimmering beauty from all sides. This design is 32 inches high, 15 inches in diameter, and is made of 16 segments of heavy crystal (eight each for the top and the bottom) fitted together over 18 clear 25- or 40-watt bulbs. Controlled by a dimmer, the chandelier can produce either a brilliant light pattern or a subdued one.

Figure 95. This crystal chandelier acts as a lighting foil and center point of interest. The dining room is actually illuminated by recessed units which direct light to the floor, which in turn reflects light to the entire space. The twelve recessed louvered units are composed of four sets of blue-white, pink and gold 150-watt reflector bulbs which are dimmer controlled, as is the crystal chandelier. Architect for this home was William R. Stephenson; Interior Designer, Helen Conway; Lighting Designer, E. W. Commery.

FLUORESCENT TYPES

The desire for more light and good lighting quality has led to the use of fluorescent tubes in the development of large luminous panel fixtures which may be attached to or suspended from the ceiling. They may be round or square in shape; in either case they are seldom smaller than four square feet in area. Plastic is often used for tube shielding when diffused lighting is desired. Louvered materials apply when diffused lighting is not a primary requirement, as when lighting matte surfaces or locations where the reflected images of the tubes will not interfere with seeing. Fluorescent fixtures designed with large luminous panels are most often used in bathrooms, dressing rooms, kitchens and family or recreation rooms (Fig. 96).

In addition some of these large luminous panels of the suspended type which resemble a luminous ceiling are also available for use with incandescent filament bulbs. See Fig. 97. Installations using combinations of the tinted light sources have proven interesting, both in appearance and lighting results.

SELECTION OF EQUIPMENT

New equipment designs offer possibilities for highly imaginative applications. Lighting quality of a satisfactory, delightful-to-live-with and esthetically pleasing nature is dependent upon the selection of fixtures which satisfactorily meet these qualifications:

(1) *Light Output* (lumens)—Sufficient to produce the desired light level* for the intended application, whether it is general area illumination or lighting for a specific activity. See Fig. 98.

(2) *Design Size*—(a) Large enough to accommodate the required light sources without producing an uncomfortably high brightness; (b) deep enough to provide sufficient distance between the diffusing shielding medium and the light sources to prevent visible "hot spots" or images of the light sources which tend to distort the appearance of the fixture, destroying the flow of line or smooth-

*See Footcandle Table to be published in reprint version.

ness of contour that made its unlighted appearance appealing. See Fig. 99.

(3) *Brightness Acceptability* — Lighted appearance visually comfortable when viewed in relation to background surfaces or surroundings, e.g., translucence of very low brightness (Fig. 100) or opaque shielding when fixture is located directly in front of the eyes as when pulley types are used at game or dining tables. See Fig. 78.

(4) *Indirect Fill-in* — Fixtures should produce some upward light in order to "soften" predominating downward lighting. When an upward light component is not provided, indirect lighting should be supplied by other lighting elements or by reflected light within the space. See Figs. 101 and 102.

Another consideration for suitable lighting application is the attainment of variable lighting levels by use of (a) multiple switch combination for control of two or more light sources within a single fixture, (b) three-lite bulbs having two filaments which, lighted separately or together, can produce three levels of illumination, or (c) dimmer device to control one or more fixtures.

Still another consideration is that of good maintenance. All surfaces of a fixture should be easily accessible for cleaning, and the replacement of light sources should be a simple operation. Attention to these maintenance factors is essential in restoring the initial lighting efficiency and effect.

Figure 96. To provide general illumination in this family-recreation room, there are three shallow 30- by 30-inch walnut trimmed fixtures equipped with six 20-watt fluorescent tubes per fixture. Wood baffles give a modular pattern across the white diffusing panel. The third unit is located over a game table at the opposite end of the room. Well proportioned table lamps provide local lighting. Int[illegible]esigner, Senya B. Troop.

Figure 97. Two-foot square plastic panels are used to form a four-by-six-foot "floating" lighting fixture which is suspended below the ceiling, free from the four side walls. Installation requires only one outlet box. Six 100-watt incandescent bulbs are used.

Figure 98. Two four-foot plastic shielded fluorescent units provide general area illumination while a continuous line of fluorescent tubes concealed under front edge of cabinets light sink, platform range, work counters.

Figure 99. The three glass globes and the cylinder of opal glass are of a size and density which produce comfortable diffused lighting without annoying brightness or visible "hot spots."

Figure 101. Semi-recessed adjustable downlights using 75-watt reflector floods are installed 32 inches apart and 12 inches out from the wall to provide reflected "fill-in" lighting, softening appearance of 29-inch diameter translucent pully fixture. Interior Designer, Garth Andrews.

Figure 100. The lighted appearance of these matching wall brackets of low brightness diffusing glass are visually comfortable against the light background of high reflectance. The ceiling fixture is located off-center and placed to light one's head for hair grooming. The same fixture also serves to provide the general illumination in this bathroom.

Figure 102. Entrance foyer in high-ceilinged room with a deep purple ceiling. Walls are white to reflect the downlighting from five, 14-inch diameter perforated black metal fixtures using three 7½-watt bulbs per fixture above the diffusing glass bottom plates. The existing ceiling outlet serves the five fixtures suspended on extension arms radiating from the center outlet. Interior Designer, Martin Klein.

CHAPTER III

Portable Lamps

Historically, the portable lamp is the oldest known type of interior lighting. Wherever or however it is used, it ties the present to antiquity. No matter how modern the design, it is still a symbol of tradition. Portable lamps contribute interesting qualities to an interior that no other decorative medium can provide, and, in addition, lighting at almost any single desired location. They also offer the advantages of flexibility in arrangement and easy movement, or transportation of equipment from one location to another. For these reasons they will undoubtedly be regarded for many years to come as an important part of residential furnishings and decoration. As with lighting fixtures, the design of and the materials used in portable lamps change almost annually; therefore, the lighting principles that are part of portable lamp design and lamp placement are presented in this section without illustrations of current models. The importance of portable lamps in a lighting scheme is evidenced by their use as shown throughout this report in the photographs of residential interiors.

Generally, portable lamps fall into two easily recognizable types; first, those that combine beauty of design with functional light for seeing; and second, those that are purely decorative and are never intended to be used otherwise. Purely decorative lamps with their oddly shaped shades, often in deep or vivid colors, their bases varying from animals and birds to human and abstract forms, nostalgic mementos of the past, coffee grinders, pistols and the like, are often delightful as illuminated conversation pieces. Sometimes these are typical gift shop items but they may be true objects d'art of museum caliber — priceless jade, prehistoric sculpture or an architectural element from ancient Greece or the Orient. These decorative lamps provide limited general lighting, brighten a shadowed corner, glow in the entrance hallway, or serve as a guide from one area to another. Every house could have a few of these judiciously used to increase its feeling of beauty and charm. They have their place, but usually providing light for critical seeing is not the function of such lamps.

Portable lamps of the functional types, through the efforts of designers who keep pace with new developments, become increasingly more beautiful, individualized in character and proportioned so as to better serve the seeing activities of our times. Portable lamp types that combine beauty with function can be easily recognized. The first important factor is *size*, the second is the *electrical parts*, and the third is the *lighting quality* provided by the mechanical elements and the shade.

SIZE

Table Lamps

Lamps intended for use on tables should be of such a size that when the table height is added to the *lamp base height* (from the bottom of the base to the bottom of the shade) the sum equals the eye height of the seated person. With conventional-type upholstered furnishings the eye-height is generally 38 to 42 inches from the floor. Thus, an average height from the floor to the bottom of the shade is 40 inches (Fig. 103).

Floor Lamps

There was a time when floor lamps were extremely tall and table lamps very short. Today the difference in over-all height between the two types has diminished; table lamps are taller, and floor lamps are shorter. The difference in height between the two from floor to lower edge of shade is now approximately seven inches. Because tall floor lamps are placed at the rear corner of a chair, the dimension from floor to bottom edge of shade is increased to clear the head of a seated person. Dimensions usually are 47 inches for junior (small-

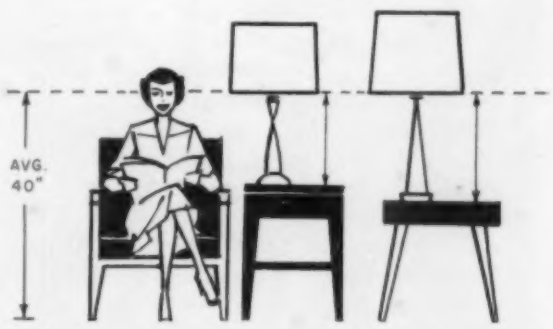


Figure 103. When selecting table lamps, follow these directions: lamp base height (measure from table top to shade bottom) plus height of table equals seated eye height (approximately 38 to 42 inches above floor).

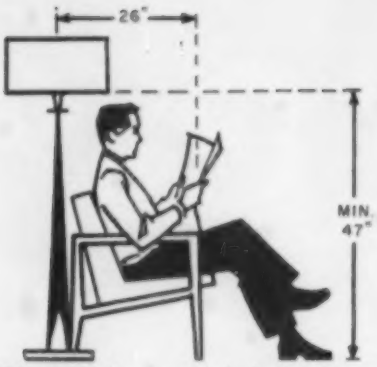


Figure 104. When bottom of shade is above eye level, lamp shaft should be about 10 inches behind shoulder (either shoulder for reading), near rear corner of chair.

scale) and 49 inches for senior (large-scale) floor lamps — as against the average of 40 inches for table lamps. See Fig. 104. All the following factors remain essentially the same.

Shades

The diameter of the bottom of the shade is the next dimension of importance. Table lamps with shades measuring 16 inches, or greater, across the bottom will allow a spread of light which will cover the reading surface of a book, magazine or similar hand-held seeing activity. (Narrower shades give a much too confined circle of light for reading in a comfortable position.) *Wall lamps* generally have shade diameters ranging from 12 to 16 inches, the smaller size being used often in pairs over a study desk or double bed. *Floor lamp* shades should be at least 16 to 18 inches in diameter across the bottom, depending upon the scale of the lamp. *Dresser and dressing table shades* may be as small as nine inches in diameter. Selection of shades is related to scale of furnishings, with larger sizes often in better proportion.

The *shade depth* may vary, but should always be sufficient to protect the eyes of a standing or moving person from looking directly into the top of the shade at the lighted bulb. Shallow-shaded modern lamps often use diffusing or perforated discs at the top of the shades.

When shades narrow in at the top, or are completely closed, there are two detrimental results. First, the heat generated by the light source, and trapped within the narrow or closed top, hastens the deterioration of the shade material. Second, the brightness difference between the downlighted area and the dark or shadowy area above is annoying and unattractive. Because this condition is a tiring one, there should be some provision for upward lighting to reduce large brightness differences throughout the field of view.

ELECTRICAL PARTS

Sockets

The light distribution of a single bulb burning base down will be most effective, delivering the major amount of useful light for seeing, if the bottom of the shade is at or slightly below the level of the top of the socket or husk. This places the light center of the bulb in the lower half of the shade. When the socket is high in the shade, too little light comes directly downward, and too much goes to the ceiling and must reach the task indirectly by reflection. Consequently, the total received at the seeing location is greatly reduced. In general, the desirable distribution of illumination is 60 to 70 per cent downward and 40 to 30 per cent upward.

Portable lamps of the multiple light source type may have the sockets in a horizontal, vertical or angle position. The percentage of upward to downward light depends on the location of the sockets within the shade.

Bulbs

For functional use the single-socket type lamps will require a minimum bulb size of 150 watts. Three-lite bulbs, which allow for greater flexibility because they give a choice of illumination levels, are available with medium bases in 50/100/150 and 50/200/250 watts. Some lamps have a larger socket (mogul) to accommodate a 100/200/300-watt bulb. Multiple-socket types require a minimum of three 60-watt bulbs to provide a quantity of light comparable to that from a single 150-watt bulb. The smallest size three-lite bulb, 30/70/100 watts, is recommended for functional use only in dresser and dressing table lamps.

LIGHTING QUALITY

Diffusion

Portable lamps for functional use should have a diffusing element of either glass (opal or ceramic coated) or plastic under the shade. The diffusing element can be of the bowl type which surrounds the bulb, or it can be a disc slightly smaller than the bottom shade diameter. The disc should be located within the shade, one inch or slightly more above the bottom rim so that in normal positions of use the eyes are protected from viewing the brightness of the disc.

The purpose of these diffusing elements is twofold. First, they refine the light so that it is soft in quality, not harsh and garish. It is easy to recognize the presence or lack of a diffusing element even without looking under the shade. If shadows are soft, and if the edge of the shade does

not produce a sharp cut-off, and if there is reduced reflected glare from shiny surfaces, the lamp is equipped with an effective diffusing element.

The second purpose for the use of diffusing elements is to lower the brightness of the light bulb, the primary source of light, and thereby create a larger surface secondary source of more nearly even light emission. This in turn will produce more nearly equalized diffused lighting upon the seeing task. Diffusing elements also aid in producing more comfortable conditions for the eyes of the very young, who often get only an under-shade view of the lighting equipment that is designed to serve adult activities.

Another diffusing method for attaining a better degree of quality, not as effective as the bowl or disc type but an improvement over a bright source, is the use of white inside-coated bulbs in the required wattage. Lamps designed without any device for improving lighting quality should not be used for visual work. However, in such lamps the use of white-coated bulbs will help to soften shadows and reduce reflected glare.

Dresser and dressing table lamps do not require a diffusing element under the shade since the light striking the face is sufficiently diffused by a shade of translucent material.

Reflectance

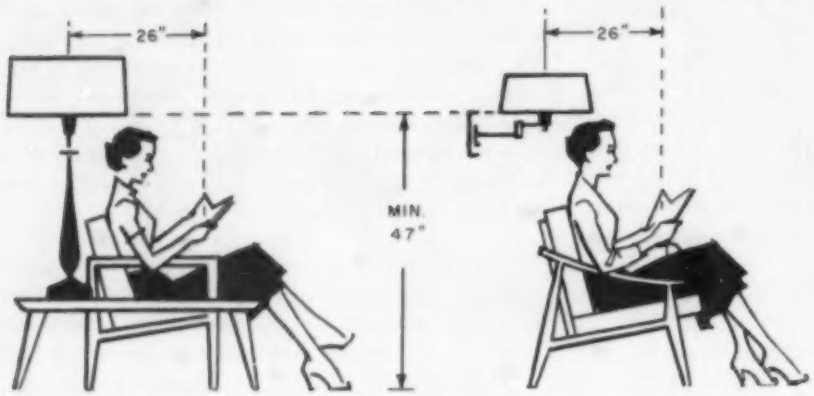
The shade material serves purposes other than that of the purely decorative. To contribute to lighting effectiveness it should have a good white or near-white inner surface so as to diffuse and reflect the light that strikes the inside of the shade. This reflected, re-directed light contributes to the amount and spread of light on the object to be seen (book, sewing, writing, etc.). When the light is not reflected, but absorbed by a dark-colored material, it is converted to heat and therefore has no value from the standpoint of lighting.

Transmittance

If the shade is translucent, of either a fabric or a plastic composition, it should have sufficient density to transmit light without revealing the exact location of the light source by a bright spot. A bright spot not only spoils the lighted appearance of the shade, but indicates that the shade lacks good diffusing density, is too high in brightness and will become visually uncomfortable over a period of several hours. Translucent shades with outer surfaces of neutral tints, off-whites, beige, or light gray, are most acceptable, as they do not distort the color of the light, and both people and objects are seen in their true colors.

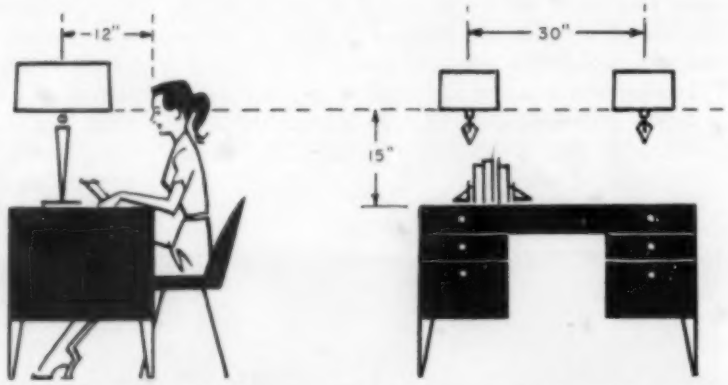
Two table lamps and a floor lamp (reflected in mirror) combine with cornice lighting to provide localized and general illumination in the portion of the room shown. Interior Designer, Beverly Reitz.

Figure 105 (A-6). Placement of lamps in accordance with the following directions combines the benefits of the best spread of light with visual comfort for the user.

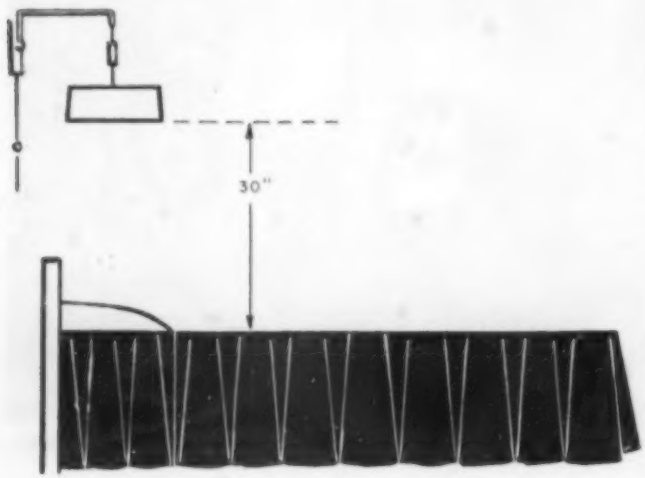


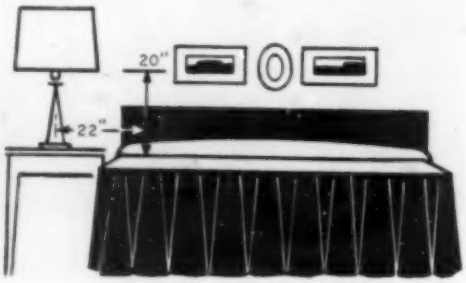
A. Reading: Large table lamp on low table and wall lamp both in floor lamp position—10 inches behind shoulder near rear corner of chair.

B. Machine Sewing: Wall lamp or swing-arm floor lamp (with vertical adjustment preferred) should be located as illustrated and centered 12 inches to the left of the needle and seven inches behind the needle.

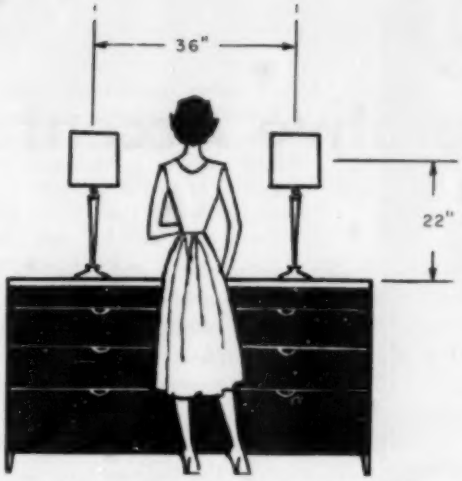


C. Desk Work: Working eye position above task should be about 14 inches. For small children, raise seat height. Shade fairly dense, in a light but not strong color, or opaque. Place desk lamp base center 15 inches to left of work center for right-handed person; to right of work center for left-handed person.

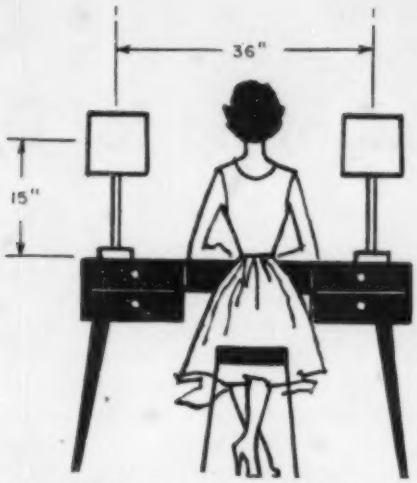


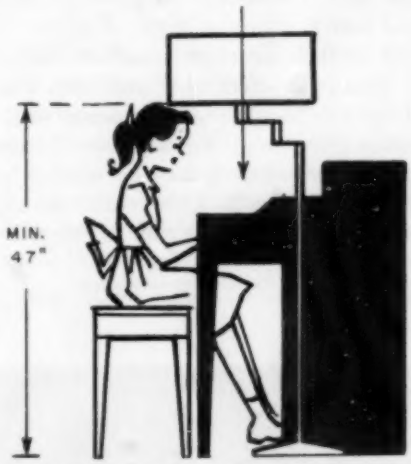


D. Reading in Bed: Wall lamp (left)—type as shown or fluorescent strip behind shielding board, locate bottom of shade or board 30 inches above mattress level. Table lamp (below)—in addition to dimensions shown, position lamp shaft 16 inches back of center of reading plane.

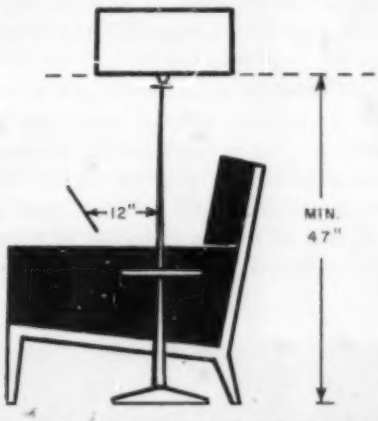


E. Grooming: Dimensions for lamps on a dresser before which one stands and on a dressing table before which one sits. Position lamps as close to mirror or wall as possible. Choose white or ivory translucent shades.





F. Piano: Light center of swing-arm floor lamp 22 inches right or left from center of keyboard and 13 inches forward from music score. Select light-colored shade for generous transmission of light.



G. Hand Sewing: Floor table lamps should be positioned closer to the work—15 inches to the side of the sewing surface and 12 inches back from the surface. Place lamp to the left of a right-handed person and to the right of a left-handed person.

Since the shades of dresser and dressing table lamps act as the diffuser of the light source, the percentage of light transmission may be higher. When high illumination is not needed for functional use, shade brightness may be reduced by the use of one of the lower wattage levels of a three-lite bulb.

Opacity

Opaque shades can have more color *on the outer surface* as they do not transmit light, and therefore the color does not affect the light quality. Very dark-colored shades have a tendency to appear as silhouetted forms. Lighter-colored shades retain their color quality under low levels of general illumination.

Opaque or low transmittance shades are invaluable in creating visually comfortable surroundings in interiors having dark walls. Opaque shades reduce uncomfortable brightness differences between the lighted lamp and darker background surfaces. The use of these types of shades in the lighter colors on desk lamps, where the lamp is always within the seeing angle, has great merit, for the low brightness is visually tolerable for long periods of time.

PLACEMENT

The position of a lamp is important in obtaining both quantity and lighting quality for the user. It is governed by activity and related furniture groupings. Figs. 103, 104 and 105 illustrate placements tested and found to produce the most satisfactory results.

CHAPTER IV

Lighting for Decorative Accent

The ways in which light may be used purely for decorative accent are diverse and almost endless, limited mainly by the ingenuity of the designer. The purpose is to attain artistry in lighting effect or to enhance the beauty in form, color, texture or line of structural elements, plantings, sculpture, paintings and other art objects. Emphasis, modeling, sparkle, shadow, subtlety, or drama are the qualities sought in decorative lighting. In this realm, lighting is an art as well as a science. The designer must understand the esthetics as well as the techniques of lighting and, especially with sculpture and paintings, consider the concept of the artist. See Fig. 106.

The choice between incandescent and fluorescent light sources depends largely upon the specific effect intended. When accurate light control (a narrow beam or wider pool of light), brilliant sparkle, or extremes in highlight and dense shadow are desired, use incandescent bulbs. If "lines" of light, soft shadows, daytime color qualities, or large areas of softly diffused light are required, fluorescent tubes are more suitable. Fig. 49* is an example of the effective combination of an incandescent bulb (giving emphasis and brilliance to the table setting) and fluorescent tubes behind a cornice, producing a line of diffused illumination on the painting and mural wallpaper. In every case, complete shielding of the bulb or tube is essential so that the object or objects, rather than the light source, are seen. If the housing of the light source is visible, attention should be given to its form, finish and scale.

Colored light is sometimes used to produce an unusual decorative effect or accent. See Fig. 107. Colored light emphasizes similar colors in a room and tends to gray complementary colors. Incandescent bulbs in pastel tints may be used to give a subtle feeling of warmth or coolness of atmosphere. Incandescent bulbs are available in many deeper

*"Lighting . . . Keyed to Today's Homes—Part I," ILLUMINATING ENGINEERING, Vol. LV, No. 10, page 546 (October, 1960).

Figure 106 (a). Without localized lighting, the figure in this reproduction is scarcely visible. (Light at sides of painting is from a pair of wall sconces.)

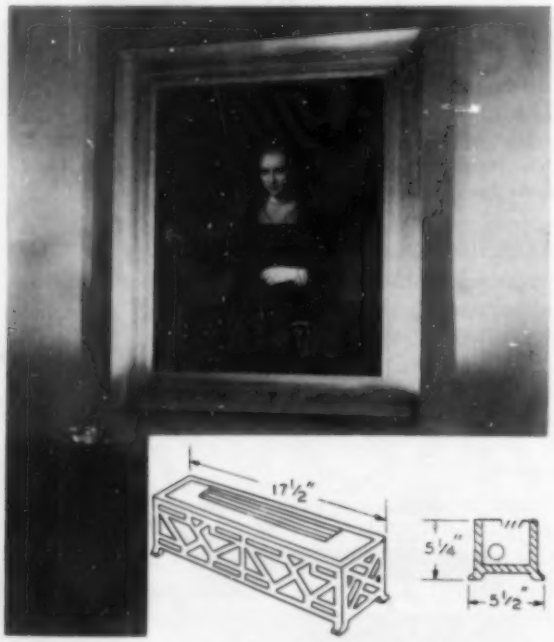


Figure 106 (b). Two 25-watt showcase reflector bulbs in a louvered mahogany box (shown in detail) on the two-tiered buffet bring The Admiral's Lady to "life."

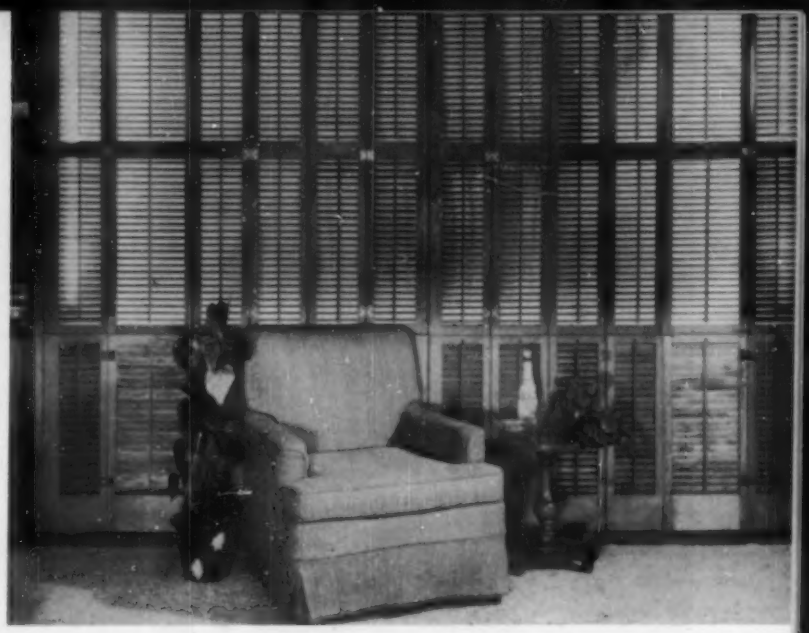


Figure 107. Interesting color and shadow patterns may be produced by a combination of tinted fluorescent tubes and incandescent reflector bulbs located in the cavity behind a shuttered wall. See Figs. 70° and 71° for suggested light source placement. (°IE, October, 1960.)

colors, and fluorescent tubes in gold, pink, blue, green and red for use when a specifically dramatic colored atmosphere is desired.

Wall-hung pictures are probably the most widely used decorative accessory in homes of all economic levels. These often require local lighting in addition to the general room illumination to give them the importance and visibility they deserve. There is a wide variety of picture lighting equipment available ranging from the conventional over-picture reflectors and spotlights to portable decorative designs in the shape of boxes, urns, spheres and other forms which may be placed on a mantel or chest beneath the picture. Examples of some of the portable under-picture lighting units and their placement are illustrated in Figs. 106, 108, 109 and 110. Over-picture units which fasten to the back of the frame should be almost as long as the picture is wide, and should be adjustable in height, distance out from picture and tilt so that they can

Figure 108. Light from black metal sphere on piano accents a family portrait and dogwood blossoms. The sphere, finished white on the inside, rests on a separate three-legged base for ease of tilting to any angle.

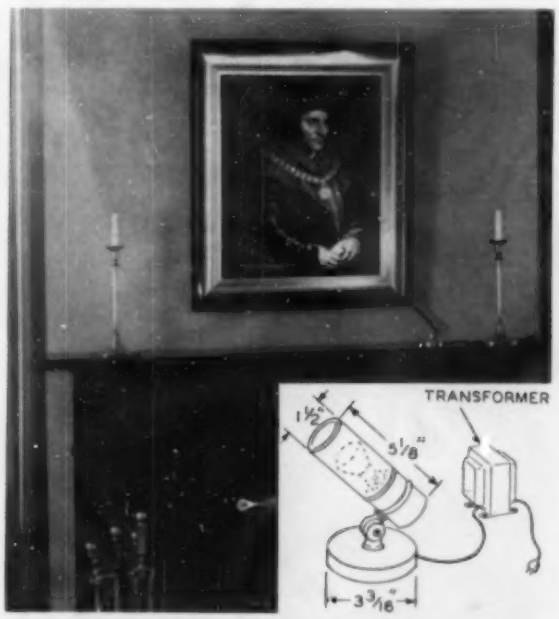


Figure 109. This portable spotlight finished in brass is a low-voltage unit equipped with an R-12, 20-watt reflector bulb operating on a 28-volt transformer located near the plug.

Figure 110. A brass planter, as used here to light an old print, may hide a fluorescent tube or a lumiline incandescent bulb.

Figure 111. Long showcase reflector strip illuminates a colorful Oriental screen. A similar unit with swivels to permit tilting is now commercially available using a fluorescent light source.

be located to light the entire subject. These requirements are met in the ceiling-suspended unit shown in Fig. 111. With some picture lighting techniques, flat moldings instead of deep frames are often necessary to avoid unwanted shadows. To minimize reflections and undesirable images special cover glasses are available.

A section of wall or an entire wall may be "washed" with light to illuminate a number of paintings or an arrangement of a collection of pictures and art objects as in Fig. 112. Other illustrations of wall lighting techniques are shown

Figure 112 (left). A wall of art "washed" with light from an incandescent lens strip concealed by a wood valance. For detail of lens strip see Fig. 26.* Interior Designer, Bertha Schaefer. (*IE, October, 1960.)

Figure 113 (above). Adjustable ceiling downlights using 75-watt projector bulbs (PAR-38) above spread lenses and a decorative bronze light tree with 30-watt, R-20 bulbs in matching reflectors direct accent lighting to paintings, sculpture and decorative arrangements. By reflection from the light-colored surfaces, a pleasing level of general lighting is achieved throughout the room. Interior Designer, Virginia Whitmore Kelly. Photograph by Alexander Georges; reprinted fom *House and Garden*.

Figure 114. Beauty and detail of the prized Chelsea tea set are seen when lighted by reflector bulbs at ends of each shelf; window sill accented by a 75-watt reflector flood bulb becomes a place to show off flowers, food, even a Christmas tree. Here is proof that today's lighting techniques can make a century-old farmhouse more liveable, more attractive. Interior Designers, Eugene and Olive Stephenson. Photograph by Lisanti, courtesy of *Better Homes and Gardens*.

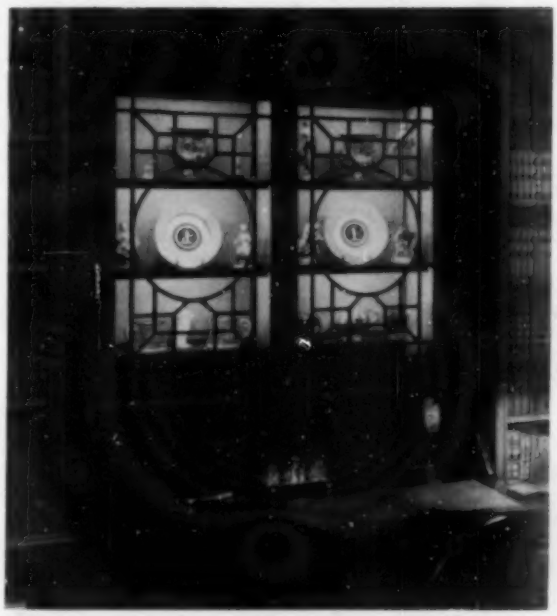


Figure 115 (above). Small, six-volt tubular incandescent bulbs, spaced three inches apart behind a narrow apron at the front edge of each wood shelf and across the top shelf, highlight a collection of rare porcelains. Lighting Designer, Thomas Smith Kelly.

in the "Interiors"[1] section and also in Figs. 22,* 25,* 26,* 77 and 84.

Cabinets and other shelf areas used to display hobby collections, art objects or finely-bound books are often dark recesses unless lighting is built in. If the shelves are of wood, light sources may be incorporated vertically at the front corners (Fig. 114) or concealed horizontally behind an apron at the front edge of each shelf (Fig. 115). With glass shelves, lighting can be concealed above (Fig. 116),

[1]To be published in ILLUMINATING ENGINEERING, December 1960.
*"Lighting . . . Keyed to Today's Homes—Part I," ILLUMINATING ENGINEERING, Vol. LV, No. 10, pages 537, 538 (October, 1960).

Figure 116 (right). A variety of prized art objects can be seen and admired in this antique desk by the light from a 30-watt, 36-inch fluorescent tube (located at the top front) filtering through the glass shelves and reflecting from the light-finished interior.

Figure 117. Fluorescent tubes behind frosted glass panels at top and bottom diffuse light through glass shelves and add to general illumination. Back panel is of lightly frosted glass which has the effect of a luminous wall from foyer behind dining room wall.

Figure 118. Recessed spotlights add light, shadow and color to setting: one with a colored lens and 150-watt projector bulb is directed on the statue, making it the center of interest; the unit over each planter uses a 100-watt bulb adjusted to project light toward sides of figure and highlight plants. Interior Designer, John Astor Perkins. Architects, Gill and Harrell.

Figure 119. The stone sculpture at the right is lighted by a lens strip in the false beam and viewed against a strip of cherry red shantung. Several other lighting techniques in this interior deserve mention: small spotlights (the same design as is shown in Fig. 109) are attached to the under front edge of the beam at the left to accent selected paintings; the antique fixture in the foyer is electrified to provide indirect illumination; in the foyer, the false "beam" built at the left (behind drapery panel on structural post) contains fluorescent tubes to light an antique console and mirror. Interior Designer, Beverly Reitz.

Figure 120. Planter room-divider is spotlighted by two ceiling-mounted, 75-watt reflector bulbs in swivel sockets concealed by deep wood box, finished to match planter base. Note cornice lighting, providing additional background illumination for recessed downlight over table.

Figure 121. From within the hollow mantel light projects downward, adding interest and color to the summertime use of this fireplace.

below, at both locations (Fig. 117), or at the sides. When lights are placed above and/or below glass shelves, objects must be carefully arranged so that the light is not blocked but can filter through the glass from top to bottom. Note that in the illustrations mentioned above, the cabinet interiors are of a light finish even though the finish of the furniture is dark.

In the lighting of sculpture, the effect desired—distance, third dimension, deep shadow perspective, silhouette, contour—dictates the number and placement of light sources and the equipment to be used. See Figs. 51,* 118 and 119.

Recessed or ceiling-attached lighting units or light sources concealed in structural elements are frequently used to enliven a planter, room divider, or fireplace. See Figs. 120 and 121. An interior brick or stone wall can be enhanced in color and texture if lighted by a series of suspended decorative fixtures or spotlights recessed in or attached to the ceiling. See Figs. 23,* 77. Lighting from an angle will create highlights and shadows and emphasize texture, as shown in Fig. 122.

As in other art forms, all decorative lighting installations may not please all tastes. Illustrations in this section and throughout the report present a variety of methods by which illumination may be applied so as to enhance art objects and interior design elements.

Figure 122. A 150-watt spotlight in adjustable eyeball unit recessed to the right strikes fireplace at grazing angle, suggesting a shaft of sunlight, emphasizing color and texture of native river-bed stones. Unit at left (300-watt flood) concentrates on dining area. Note effect of direct-indirect element extending from fireplace to structural wall. Architect, Frank Lloyd Wright.

*"Lighting . . . Keyed to Today's Homes—Part I," ILLUMINATING ENGINEERING, Vol. LV, No. 10, pages 547 and 537 (October 1960).

A Portable Reflectance Meter

By A. HADLEY TAYLOR

The percentage of light reflected by any particular surface is affected by its color, specularity etc., as well as by the spectral character and spatial distribution of the incident light. Consequenty, it is desirable to choose conditions of measurement most nearly representative of those applying in the use of the data. As explained in the paper, the meter described is designed with these requirements in mind.

At the Cleveland convention of the Illuminating Engineering Society in 1920, it was the author's privilege to present a paper entitled "A Simple Portable Reflectometer of the Absolute Type."[1] The reflectometer described at that time employed a small integrating sphere, the photometric measurements being made with a Macbeth Illuminometer. Modern photometric practice has largely substituted electronic for visual measurements, hence it seemed desirable to modernize the 1920 reflectometer in this way to make it more useful to illuminating engineers. The present meter is the same in principle as the previous one, but with certain important improvements which make it easier to use and which make the results more applicable to present day lighting.

Basic Theory: If the inside surface of a hollow sphere is coated uniformly with a diffusely reflecting white paint obeying the cosine law of reflection, it has been shown[2] that any elementary illuminated area of the surface uniformly illuminates all other areas of the sphere surface regardless of their location with respect to it. Consequently, the total illumination of any area is the sum of the light flux (F_d) received directly from the light source and that received by subsequent multiple reflections (F_r). This result is based on the assumption that there are no obstructions in the sphere to prevent complete diffusion of the reflected light.

The reflectometer described herein and shown in the photograph, Fig. 1, employs a 4-inch hollow sphere coated inside with a highly reflectant white paint with excellent diffusion. A lighting tube containing a small low-voltage lamp and suitable lenses is set at an angle to the sphere surface and can be rotated about an axis normal to the surface. This allows a spot of light to be directed onto a test surface placed under a 1¼-inch hole in the bottom of the sphere or onto the sphere wall.

At a point 90 degrees from the lighting tube another tube is attached. It contains a lens system and color filters. The lens focuses a small area of the opposite sphere wall onto the iris diaphram of a camera shutter, behind which is placed a small phototube. Wall area viewed by this system is screened from test surface by a small opaque screen.

When the lighting tube is positioned to illuminate the test surface the light must be reflected once by the test surface and once by the sphere wall before any of it reaches the area viewed by the phototube, because of the screen interposed between this spot and the test surface. However, when the light is projected onto the sphere wall at a spot unscreened from the spot viewed, it need be reflected only once by the sphere wall before some of the reflected light reaches this spot. As pointed out above, light reflected by the sphere walls is perfectly integrated; thus the difference in amount of light reaching the observed spot in the two cases is the amount absorbed by the test surface when incident light is directed onto it. The ratio of the

Figure 1. Photograph of reflectance meter and amplifier.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 11-16, 1960, Pittsburgh, Pa. AUTHOR: Retired Physicist, Cleveland, Ohio. Accepted by the Papers Committee as a Transaction of the IES.

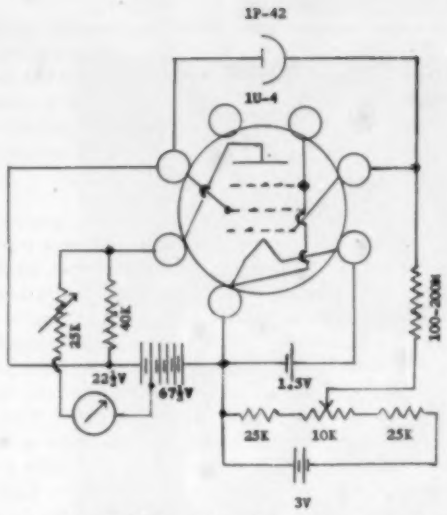


Figure 2. Simplified wiring diagram of amplifier. A selector switch makes it possible to measure battery voltages.

meter readings in the two cases is the diffuse reflectance for light incident at approximately 45 degrees from the normal to the surface. Thus the reflectometer is an absolute instrument requiring no reflectance standards.

Since many wall surfaces are tinted, illuminating engineers would probably be most interested in diffuse reflectance values as applying to light from standard cool-white fluorescent lamps. The phototube used has an S-9 photosensitive surface, which is much more blue-sensitive than the average eye. The light source used is a flashlight-type lamp operating in the color temperature range of approximately 2600-2800K. By use of suitable color filters it is possible to approximate the spectral response of an average eye to a 4300K source, the color of the light from the standard cool-white fluorescent lamp.* In determining suitable filters the author has used the spectral response curve of an S-9 photosensitive surface as furnished by the phototube manufacturer. Admittedly the spectral sensitivity of any particular phototube may vary from the average curve, hence at best the color correction can only be assumed to be approximate. When dealing with relatively unsaturated colors the correction is probably adequate for practical purposes.

A simplified wiring diagram of the amplifier is shown in Fig. 2. Provision is made for measuring battery voltages so that one can determine when they should be replaced. The sensitivity of the amplifier is controllable, so that it can be adjusted to give a full-scale reading when the light is projected onto the sphere wall. While the photograph shows a 50-microampere meter, it is probable that a 100-microampere meter will be used later. Then it would be possible to set the meter to read 100 with light on the sphere wall and the reading with light projected onto the test surface would give the reflectance directly.

Some of the errors in reflectometry have been discussed by the author in a previous article.[3] One of these, common to practically all uses of the integrating sphere, is lack of perfect diffusion by the sphere window (usually some type of diffusely transmitting material). This source of error is often minimized by use of the "substitution method" in which the photometric standards have approximately the same spatial distribution of light as that of the test lamps. In the reflectometer described above, this error is avoided by the optical system which views an area of the sphere wall directly. However, the author has in mind a further development by which a cosine-corrected window might be achieved and used later.

The author wishes to thank Mr. Howard Haynes for many helpful suggestions and for the use of his laboratory facilities in developing the amplifier.

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1. Taylor, A. H.: "A Simple Portable Reflectometer of the Absolute Type," *Trans. IES*, Vol. XV, p. 811, 1920.
2. Rosa, E. B. and Taylor, A. H.: "Theory, Construction and Use of the Photometric Integrating Sphere," *Bur. Stds. Sci. Pap.* No. 447, 1922.
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DISCUSSION

A. R. CHICK:* It is inferred in this paper that the phototube used is normally not corrected to give a response following the CIE Luminosity Function. Can it then be expected that true reflectances of colored surfaces will be measured even for illumination from incandescent sources?

Later in the paper it is indicated that the phototube can be corrected to approximate the spectral response of an average eye to a 4300K source to provide reflectance values applying to light from standard cool white fluorescent lamps. With the wide difference in spectral energy distribution between an incandescent source and a fluorescent source of the same color temperature, will this device then properly evaluate reflectance under the latter condition?

Experience has indicated that the reflectance value obtained for many surfaces will vary with the manner in which light is incident on the surface and the manner in which the reflected light is collected. This device uses a pencil of light incident on the test surface at an angle of about 45 degrees and then by means of the sphere collects the light diffused from that surface. This approximates the condition found in the so-called Baumgartner Sphere Reflectometer that has been in use in many laboratories since about 1938. Are the results obtained with these two devices compatible?

*Electrical Testing Laboratories, Inc., New York, N. Y.

*It is a well-established fact that the spectral energy distribution of a cool white fluorescent lamp differs greatly from that of a "blackbody" at any temperature. Also, lamps made by different manufacturers vary because of differing phosphors used. However, 4300K appears to be a suitable value to strive for on the best information the author has been able to obtain.

Will it not still be necessary in reporting reflectance values to indicate the instrument used or the conditions of incidence and reflection?

W. M. POTTER:* It is gratifying that the author's new direct-reading, non-visual instrument retains the desirable optical characteristics of its predecessor and that it is at least as portable.

It has been a matter of concern to some that the different optical patterns of other devices have not been such as to contribute to accurate absolute values. A lack of cosine-corrected pick-up cannot but contribute to error between measurements on surfaces which differ in degree of specularity or diffusion. Mr. Taylor's reading (of relative brightness) of a spot on the diffusing sphere interior minimizes this source of error. The author may be asked if he has available comparative readings with different instruments on samples of various types.

At the same time, there are other possibilities for further improvement which may warrant study. For example, the illuminator lamp could remain stationary, and have its beam deflected from sample to sphere by suitably rotated mirrors or prisms. If this or other modifications called for a somewhat larger sphere this should not be inherently objectionable—in fact, it might promote accuracy because the sample and other sphere openings would occupy a smaller proportion of sphere area. Again, could not changeable filters associated with the source be incorporated to cope with other spectral distributions?

Although small-sized, readily portable meters have an advantage in the field, I believe there is a place for a similar laboratory instrument for research, checking materials, etc. Portability would not be a primary requirement; this would permit the use of actual light sources of different spectral distributions if the incident beam were deflected by the means mentioned above. Then, with a photocell and filter designed for proper response, direct substitution of actual lamps would reveal the differences in reflectance due to the illuminant. It might even be possible to design the instrument for a range of angles of incidence of the beam on the sample.

I would like to add a word of caution on the use of such instruments in measuring reflectance of translucent materials. It may not be amiss to emphasize that if the reflectance of the translucent sample *only* is desired, it should be backed by a non-reflecting object, preferably an opening in a black-velvet-lined box or a flat swatch of black velvet. Failure to take this precaution can result in large error.

G. A. HORTON:** The reflectometer described in the paper represents another step forward in reflectometry in that it is a portable, physical-type instrument which may be used by those with little experience in the science of reflectometry. It should prove quite convenient for those who are engaged in the application of interior lighting by means of coefficients of utilization, since the reflectance of ceilings, walls and floors may be easily measured.

I believe that it should be made clear that the sphere opening should be in contact with the test surface both when the hundred per cent and test readings are being made.

There is still a need for a smaller total reflectance measuring instrument of the absolute type for measuring the reflectance of lighting reflectors, some of which may be as small as eight or ten inches in diameter. One such instrument with a two-inch integrating sphere is available, but it is strictly a substitution instrument, especially when the surfaces being measured are specular in character. In other words, the calibrating panels must have almost exactly the same degree of specularity and color as the unknowns to be measured. It is hoped that the author may be able to sometime turn his attention to the solution of this problem.

I would also like to know if the instrument described in the paper will be available commercially.

A. HADLEY TAYLOR:* In reply to Mr. Chick's question regarding the correction of the phototube to give a response following the CIE Luminosity Function, I did not intend to imply that this is not normally done when phototubes are used in photometry. In most photometric problems, a suitable filter can be used so that the response will closely approximate that of the so-called average eye. So long as one is dealing only with neutral or nonselective surfaces, this is the only correction needed with the Reflectometer. However, in practical use of the instrument, it is necessary to measure reflectances of colored surfaces and, as the paper points out, reflectances of such surfaces are dependent upon the spectral character and spatial distribution of the incident light. Consequently, I have attempted to incorporate two corrections: (a) to correct the response of the phototube to approximate the CIE Luminosity Function and (b) to step up the color of the light source (approximately 2700K) to 4300K. A single filter combination susbtantially accomplishes this requirement. The values measured for colored surfaces will then be approximately those applying to standard cool white fluorescent lamps (see qualifying footnote in paper). For neutral surfaces the values would apply to all sources, but for colored surfaces and filament lamps the results would be somewhat high for blues and low for reds, with degree of error dependent upon the saturation the colors.

I regret that I failed to refer to the Baumgartner Reflectometer in the paper. It is a laboratory instrument rather than a portable meter and operates on the same basic principles as my meter. Its results are in terms of reflectances for filament lamps. Results obtained by the two meters should be compatible for noncolored surfaces. However, I agree with Mr. Chick regarding the desirability of indicating the conditions of measurement when reporting reflectance values.

In reply to Mr. Potter's discussion of other means of shifting the light spot from sphere wall to test surface, I have spent a great deal of time studying other methods of doing this but finally gave them up because they required a sizable mirror or prism projecting into the sphere, therefore interfering with the unobstructed diffusion of light within the sphere. With a larger sphere in the laboratory this might be less important. Much work would be involved in the development of a reflectometer which could use interchangeable light sources.

I have not compared results obtained with this reflectance meter with those of other instruments.

Mr. Horton discusses the need for an absolute reflectance meter for measuring the reflectance of the surface of formed reflectors. This is quite difficult since the edges of the opening in the sphere should be in light-tight contact with the test surface. With any contour other than a spherical surface, the hole in the reflectometer would have to be noncircular. It could probably be shaped to fit one nonspherical surface, but would be unsatisfactory for others.

No arrangements have as yet been made to supply these meters commercially, but if there is a real need it might be possible to do so.

*General Electric Co., Nela Park, Cleveland, Ohio.
**Westinghouse Electric Corp., Cleveland, Ohio.

*Author.

INSTALLATION AT SUPERIOR STEEL DIVISION, COPPERWELD STEEL CO., CARNEGIE, PA.

High-Bay Industrial Lighting

LIGHTING OBJECTIVE: To provide general illumination for rolling steel strip in the cold mill area of a steel mill.

GENERAL INFORMATION: The area shown, which houses a Sendzimir mill for rolling stainless and alloy steel strip to close tolerances, measures 56 feet by 280 feet. The height from the wood block floor to the roof trusses is 36 feet. Ceiling and columns are painted a light grey.

INSTALLATION: Thirty-nine Benjamin Electric Manufacturing Co. catalog No. V-9457-SHB, high-bay spread type, Alzak aluminum luminaires provided an average illumination level of 70 footcandles after 2000 hours of operation. All units are mounted on brackets attached at roof truss level and are spaced on 16-foot by 20-foot centers. Each unit is equipped with one 1000-watt improved-color H12KP mercury lamp.

Lighting designed by J. F. Maloney and John Cirata, under the supervision of Colonel W. L. McCulla, Chief Engineer, Superior Steel Division, Copperweld Steel Co., Carnegie, Pa.

Lighting data submitted by E. M. Wenner, Industrial Salesman, Duquesne Light Co., Pittsburgh, Pa., as an illustration of good lighting practice and to aid in the design of similar installations.

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New Two-Level Lamp for Residential Application

By GEORGE J. EDWARDS
MARY E. WEBBER

This paper analyzes the design and operating characteristics and the user advantages of series-connected filaments in the new multiple-filament lamps. The application and performance of these lamps in portable lamps for residential use are discussed in terms of the new IES footcandle recommendations.

Part I — Design

Background, Characteristics and Comparison with Three-Level Lamps

A not unusual event in the use of a multiple-light-level lamp is the discovery, sooner or later, that it will operate at only one level. The most-used of the two filaments usually will have burned through its normal life and failed, while the less-used one still will be good for many hours.

It is the feeling of lamp manufacturers that a half-dead lamp is a source of annoyance to the user. On the one hand, the user has the natural impulse to get what he can out of the remaining filament; on the other, he is dissatisfied with the inconvenience in switching and with the single lighting level still available, especially since it is probably the one he has needed least.

Series Filaments Improve Performance

A new design principle virtually eliminates the occurrence of half-dead lamps, and improves the efficiency of the main light source in the lamp. All of the "high position" wattage has been concentrated in a single filament, producing a marked increase in light output for the power expended. Part of this saving is used to insure full life in the "low position." In this position, a long-lived low-wattage filament is placed in series with the major filament. The long-life design of the minor filament, coupled with the series operation of the two filaments in the "low position," insures full operation throughout the normal life of the lamp.

"Major filament" is the high-wattage tungsten coil; "minor filament" is the low-wattage tungsten coil. In the new two-level lamp, "high position" or "high level" refers to the burning of the major filament alone; "low position" or "low level" refers to the burning of the major and minor filaments in series. In the conventional three-light-level lamp, "high position" or "high level" is the burning of both the major and minor filaments in parallel; "medium position" or "medium level" is the use of the major filament alone; and "low position" or "low level" is the minor filament alone.

In the three-light-level lamp, the normal operational sequence is "low-medium-high-off" or "high-medium-low-off," depending upon the switching arrangement provided by the socket. In the conventional lamp, the independence of each filament and the many possible combinations of burning time make it likely that lives of the major filament and minor filament will be substantially unequal. If the major filament burns out, the user is left with, in most three-level sockets, a "low-off-low-off" switching sequence. If the minor filament fails first, the sequence is "off-medium-medium-off." In either case, only one of the three levels is left, and in neither case is the high level still obtainable.

Why A New Lamp Is Needed

Suppose, for example, we take a lamp with two filaments of identical design, each burned an equal time. In Fig. 1, the center curve shows probable percentages (p) of lamps remaining after various periods of burning of single-filament lamps with a 1000-hour design-life and a standard deviation in life of 30 per cent. Assuming two such filaments per multiple-level lamp, the lower curve shows at successive hours the probable percentages (p^2) of lamps remaining in which neither filament has

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 11-16, 1960, Pittsburgh, Pa. Authors: Large Lamp Department, General Electric Co., Cleveland, Ohio. Part II of the paper was prepared by Miss Webber.

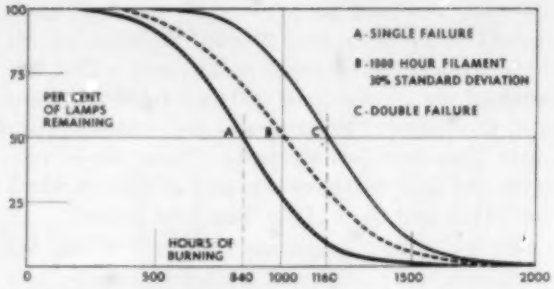

Figure 1. Filament life in a two-filament lamp. Lower curve A shows probable percentages of three-level lamps having full use of three levels at various hours of life. Upper curve C similarly indicates percentages having only one level remaining at various hours of life. Middle curve shows expected life for either of two identically designed filaments in this hypothetical lamp.

failed. The upper curve shows, at successive hours, the probable percentages ($2p$-p^2) of lamps remaining with at least one filament still operable. These curves represent the result of chance physical differences between the filaments and between lamps.

The area between the upper and lower curves represents lamp-hours of operation with only one filament operable, and that under the lower curve represents lamp-hours with two filaments operable. From these areas it can be concluded, in this theoretical case, that probable hours of operation with only one level available are 41 per cent of the probable hours of operation during which the full three levels are available.

Another way of stating the situation is the observation, from these curves, that the median life based on burn-out of one filament is 85 per cent of design-life. On the average, for lamps with both filaments burned equally, over 27 per cent of the life will be with one dead filament and this percentage may be much greater when one filament is used more than the other. This appears to be a greater source of customers' irritation with lamp life than does the absolute level of life.

Choices Made In Design

Since most household lamps are known by their wattage, the high-level wattages were chosen first. These were made to correspond to the high-level wattages of existing three-level lamps. The major filament design-lives were made the same as the major design-lives in the corresponding three-level lamps.

By relating major and minor filament lives statistically, a minor filament design-life was selected to be sufficiently long to minimize failure of the minor filament before the major, while permitting maximum consistent efficiency.

It was decided to maintain a ratio of 4 to 1 between the high-level and low-level lumen ratings, rather than to copy existing lamps or to select one standard low-level for use with the various high-level wattages, or to specify an arbitrary low-level wattage.

By changing the resistance of the minor filament, while holding its design-life constant, the division of voltage between the major and minor filaments can be arbitrarily fixed within a wide range. Of course, the low-level wattage and efficiency also change. This permits setting the lumen ratio within a wide range, at one end of which the major filament provides most of the light even when in the low-level series connection. At the other end of the range, the minor filament provides all of the low-level light.

This is the case at the 4 to 1 lumen ratio selected. At this ratio, the voltage across the major filament is kept sufficiently low in the series connection that major filament life is not affected materially by the low-level operation. Fig. 2 shows the effects of voltage reduction upon the performance of the major filament.

More Efficient High-Level Output

A major advantage of the new design is improvement of the high-level efficiency. This is the level most often used for reading or working and the one where there is most advantage in obtaining maximum light for the power expended.

By packing all of the high-level wattage into one filament, instead of two, energy losses are reduced. Fig. 3 shows the improvement in efficiency of gas-filled lamps as the wattage of the filament is increased. The proportion of radiation in the visible wave lengths increases as the filament temperature rises with wattage. Also, less energy is lost, proportionately, from the filament in the form of heat conducted away by the surrounding gas, since the hot gas sheath around the filament is smaller rela-

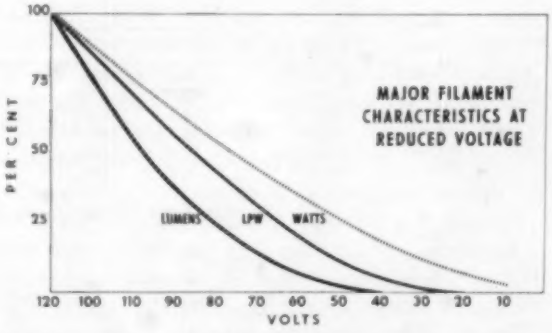

Figure 2. Effect of reduced voltage occurring in low-level, series operation of the major filament.

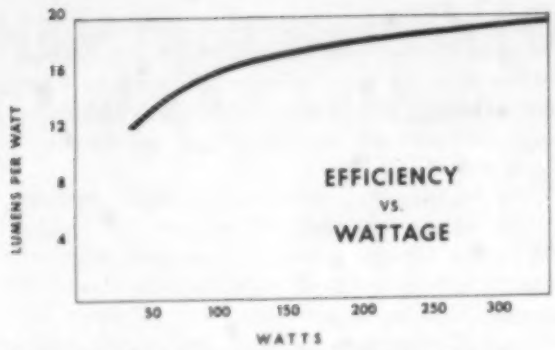

Figure 3. Demonstration of how efficiency increases with design-watts in common 120-volt gas-filled lamps.

tive to wattage in the single high-level filament of the two-level lamp.

Since the minor filament is designed for a lower voltage and longer life, it tends to be stronger mechanically than its counterpart in a three-light-level lamp. The efficiency of low-level operation, however, becomes approximately 70 per cent that of the low-level filament of the conventional three-light-level lamp. This is because of the extra-long life of the minor filament in the new design (3500 hours or more) and because of the power consumed by the major filament while operating in the series connection at less than its designed voltage.

Table I compares the wattage, efficiency and lumens of three standard wattages of three-level and two-level lamps. The two-level lamps give 14 to 20 per cent more light at high level, with a similar increase in efficiency.

The 4 to 1 lumen ratio between the high- and low-level settings was selected as giving two desirable levels—one for effective lighting for working and reading, one for general illumination. Because of the 4 to 1 ratio selected, the low setting of the 100-watt two-level lamp gives 20 per cent more lumens than does the 30-watt filament of its 30-70-100-watt three-level counterpart. The low levels of the 150-watt and 300-watt two-level lamps are, respectively, two and five per cent less than their three-level counterparts. These three two-level wattage types have low-level efficiencies which are 70 per cent those of the three-level types.

When the new lamps are compared to the old with equal use on high and low levels, average light from the two-level lamps is 9 to 20 per cent more than from the three-level lamps; power consumed is 9 to 17 per cent more, so that under these conditions, the average efficiency is as good as or up to three per cent better than the efficiency of the three-level counterparts. Of course, there are many possible methods of comparison, but there is an economic advantage in favor of the two-level lamp for all cases except where the low position is burned for extra long periods of time.

In designing the new lamp, a choice was made between two possible base-wiring designs. One would give a sequence of "low-high-high-off" or "high-high-low-off," depending upon the switching arrangement provided by the socket. The other would give a sequence of "high-low-high-off" with either of these two types of switches. The "high-low-high-off" sequence was the base-wiring design chosen, because of the uniform operation with either of the two switching arrangements, and because the sequence always produced a change in light-level for each new switch position selected. Fig. 4 illustrates the wiring and switching arrangements for both the three-level and two-level lamps, in existing sockets. In addition, an opportunity exists for the development of sockets specifically for the new lamp, which would give a "high-low-off" switching sequence.

TABLE I.

A—Comparison of Two-Level and Three-Level Lamps.

High Watts	Lamp Type	Major Design Life (Hours)	High		Low			Equal Use Averages		
			LPW	Lumens	Watts	LPW	Lumens	Watts	LPW	Lumens
100	2-Level	750	15.2	1520	51	7.0	355	76	12.4	937
	3-Level	750	12.6	1260	30	9.8	295	65	12.0	778
150	2-Level	750	16.2	2430	70	8.3	580	110	13.7	1505
	3-Level	750	14.3	2140	50	11.8	590	100	13.6	1365
300	2-Level	1000	17.5	5250	135	9.6	1300	218	15.0	3275
	3-Level	1000	15.4	4610	100	13.7	1370	200	15.0	2990

B—Per Cent Change from Three-Level to Two-Level Lamps.

High Watts	Major Design Life (Hours)	High		Low			Equal Use Averages		
		LPW	Lumens	Watts	LPW	Lumens	Watts	LPW	Lumens
100	750	+20	+20	+70	−29	+20	+17	+3	+20
150	750	+14	+14	+40	−30	− 2	+10	+1	+11
300	1000	+14	+14	+35	−30	− 5	+ 9	0	+ 9

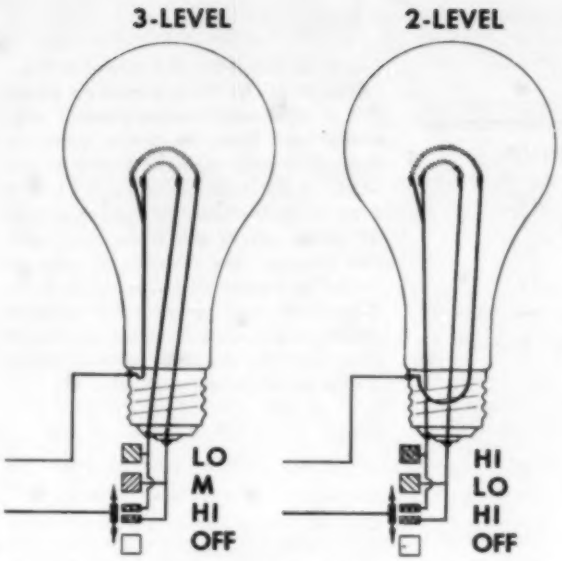

Figure 4. Base connections and switching of three-level and new two-level lamps.

Part II

Application and Illumination Performance

The two-level lamp is planned for those luminaires in residential interiors using three-way switching sockets in base-down position. The latter are supplied popularly in portable lamps of wall, table or desk, floor, and boudoir types. However, the majority of present portable lamps are not equipped with three-way sockets. Portables equipped with these sockets usually are placed within furniture groupings where visual tasks are performed.

On the average nationally, according to the best available statistics, a little over 50 per cent of the three-level multiple-filament lamps now in use in homes are the 150-watt size. Thus, the major test work reported here is for the two types of multiple-filament lamps in this size, operated at their maximum wattage and used in the most popular, table-based, portable type. Sufficient checking was done with the 100- and 300-watt sizes to assure that they perform in similar patterns.

Test Procedure

By intent, the testing was done in a modest-sized room furnished in residential character. Area of the room was 210 square feet, or slightly more than an IES standard test room. Approximate reflectances were: 8½-foot high ceiling, 72 per cent; two walls, 62 per cent; one wall, 65 per cent; one wall with figured draperies, 35 per cent, average; floor, 20 per cent. On the wall near the tested portables, a four- by five-foot board with 53 per cent reflectance was hung. It is of interest to note that in two-tests, made in an essentially standard test room, the average illumination on the test plane was substantially the same.

All lamp bulbs used were seasoned, rated and operated under controlled voltage conditions. Five illumination readings, one in the center and one in the four corners of the 12- by 14-inch test plane, were made with the G.E. Multi-Cell Light Meter. Two typical applications, reading in a lounge chair and studying at a desk, were selected for comparative illumination from the two types of multiple-filament bulbs. In each case, placement of the table lamp in relation to the test planes was as shown in Fig. 5. In the desk position, the resulting illumination from identical type table lamps may be expected to be about twice that of end table placement because of the closer relationship of the light source to the test plane.

It is characteristic of multiple-filament lamps that illumination on the test plane varies slightly as the lamp is rotated. This is due to the varying position (edgewise to crosswise) of the filament or filaments with respect to the test plane. Therefore, the lamp was rotated and measurements taken in the center of the plane for each 30 degrees of rotation, resulting in twelve readings. Before the five readings on the test plane were taken, the lamp was turned to give a reading at the center of the plane that represented the average of the twelve. With the three-level lamp (150-watt size) the greatest variation as the lamp was turned, slightly over three footcandles, occurred when no diffusing medium was used. With diffusion, the variation between the twelve positions was under one footcandle.

Two table lamp types were selected for the major tests; one, typical of the great majority of lamps without any diffusing medium (Fig. 6c), the other having the best light-controlling bowl yet devised for a single-socket, base-down unit (Fig. 6a). The lower edge of the shade was properly located[1] in line with average eye position, for a person seated in a lounge chair or at a desk. Since neither a harp nor a bowl hold a shade perfectly straight when the total lamp is moved, a method for doing this was devised. Thus, the table lamp base could be turned independently of the shade.

The same shade was used in comparative tests—one of high density, about 10 per cent transmission, with a 14-inch depth, 15-inch top diameter, and the 16-inch bottom diameter essential for these applications. An identically proportioned shade of relatively high transmission, 20 to 25 per cent, produces somewhat lower illumination on the test plane. Shades with sharply slanted sides outper-

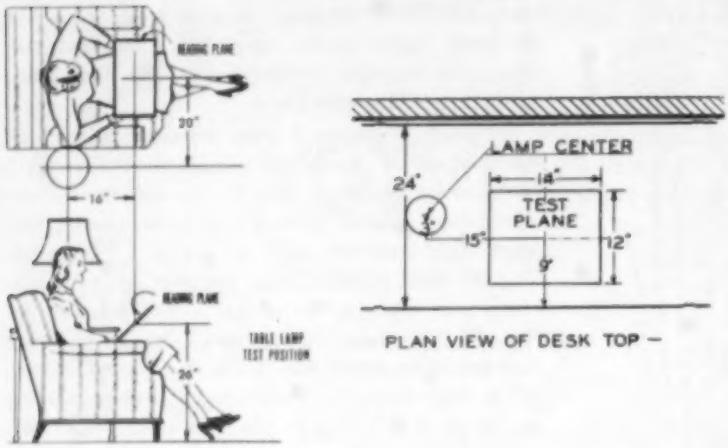

Figure 5. Far left: IES prescribed location of 12- by 14-inch reading plane (tilted 45 degrees toward reader) with dimensions from its center point to vertical axis through the center of the shade of the table-based lamp. Lower edge of shade should be approximately 40 inches above the floor, even with the average eye height of persons seated in lounge chairs or sofas. Left: Prescribed test plane and related positioning for study situation. Lower edge of shade should be approximately 15 inches above the desk top.

form the nearly-straight-sided ones of the same density. While the primary purpose of a shade is to shield the bulb, one of its important functions is to act as a reflector.

Illumination Performance

The increased output of the new two-level lamp makes it possible to obtain practically the same average illumination on the reading test plane with a CLM-type diffusing bowl as from the same 150 watts in a three-level lamp without any diffusing bowl. Some of this increment, in addition to the increased light output, comes from the more favorable position of the light center in a table portable meeting CLM specifications (Fig. 6). Light center position and other advantages of this design have been previously reported.[1,2]

The average illumination increase on the test plane between the three- and two-level lamps in identical equipment, without a diffusing medium, is of the same order as the lumen increase, 14 per cent, in the 150-watt size. All tests showed a slightly higher illumination increase for the two-level lamp used in the CLM-type bowl. This may be due to slight variations in testing procedure, or to the better utilization of the increased lumens concentrated in a single filament.

It may be expected that the consumer will receive, with no additional bulb or electricity cost, an increase in illumination of the same order as the lumen increases noted. This applies for each wattage size of the soft white two-level lamp over the three-level type. Also, the selection of the high level necessary for visual activities is simpler with the two-level lamp since the difference in light outputs between levels is more apparent than that typical of the three-level lamps.

If most consumers are to receive the full advantage of the extra light output incorporated into the bulbs, better design is required than is available in the portable lamps that are mass supplied today. Aside from those which must meet federal specification for government housing, a minority incorporate a diffusing medium of the high utilization required by the CLM specifications. It seems to have escaped notice that diffusing media, in addition to softening the light, have the important function of directing light toward the visual task rather than merely downward within the confines of the shade.

It is inconceivable, with today's development in plastics, that a highly transmitting and diffusing disc cannot be designed for this need. Devised for simple attachment and removal for bare lamp sockets, such an element would have some of the advantages of the glass bowl and meet some of today's merchandising situations. To explore the possibilities, one disc, of about 50 per cent transmittance, 11 inches in diameter, located two inches above the lower edge of a 10- by 16- by 10-inch deep shade was tested for the study situation. This

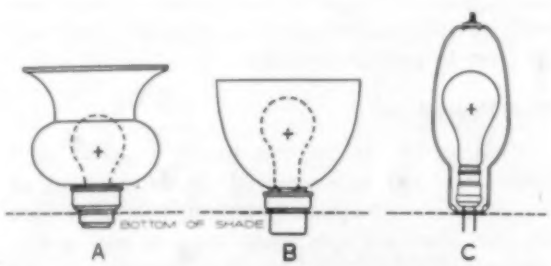

Figure 6. Most favorable location of lower edge of shade for three typical under-shade treatments and associated light center positions for 150-watt two- or three-level, multiple-filament lamp. As light center is lowered in shade, average of five test plane readings increases.

TABLE II—Performance Compared with 1959 IES Recommendations.

	Two-Level Lamp				Three-Level Lamp			
	Casual Reading		Study		Casual Reading		Study	
	Initial	After Depreciation*	Initial	After Depreciation*	Initial	After Depreciation*	Initial	After Depreciation*
IES Current Recommended Value—"Minimum on Plane at any time"		30		70		30		70
Best Experimental Assembly Table-Based Design (CLM), 150 watts.								
Minimum fc on Plane	13.7	11	32	27	11.7	9	27	23
Average value in ( )	(25)		(49)		(21.5)		(42)	
Eare Lamp in Best Assembly, 150 watts.								
Minimum fc on Plane	12.5	10			10.8	8.5		
Average value in ( )	(30)				(26+)			
Best Experimental Table-Based Design (CLM), 300 watts.								
Minimum fc on Plane	33	25	66.5	52	28	20	55	42
Average value in ( )	(48)		(87)		(41)		(.3)	

*Maintenance factor is an average based on cleaning twice a year and assumptions described in Reference 4, Appendix B.

resulted in an increase in illumination of over 10 per cent as compared to a CLM desk-type lamp. One of the big advantages was that the disc brightness was under 1000 footlamberts.

Approach to Recommended Illumination With Current Portable Lamps

The 1959 illumination values[3] tabulated for those specific home tasks most frequently supplied by portable lamps, represent increases of 25 to 150 per cent over the previous recommendations.[1] In effect, the increases are much greater because the new standards require, for the first time, that the stated footcandle value be "minimum on the task at any time." The earlier recommended values represented an average of five readings on the designated planes, with a prescribed maximum variation between the highest and lowest readings.

Table II provides sample test data on the actual performance of selected portable lamp types for specified tasks in relation to the current recommended values. They may be considered fairly representative of other tasks served by one single-socket portable lamp. Floor lamps of comparable design provide a very slightly lower average and minimum footcandle value for the reading plane.

Table II reveals that little toward the stated footcandle goal can be gained in the single socket base-down portable type by increasing lamp wattage, in view of economic and brightness restrictions. A progressive step is possible, at least for the minimum 30-footcandle level, with a higher wattage than the 150-watt in a medium socket two-level bulb. Some gain is possible in single-socket portable lamp design as has been indicated above. Also, there is possible gain in designs using multiple sockets. It is probably presumed that the needed additional footcandles on the task are produced by the room's general lighting system. In rooms where portable lamps are typically used, the recommended average general illumination is ten footcandles. However, experimental tests show that the contribution to the reading plane, from typical placements of three to four additional portable lamps and a central ceiling fixture amounts to only three or four footcandles. Thus, in most cases, the attainment of the current recommended values is dependent upon coordinated supplementary lighting designed and located to direct light specifically to the task plane. It should be pointed out that when the recommended value is greater than 30 footcandles, especially for reading, the localized auxiliary lighting becomes custom-designed and must be applied with architectural and decorative suitability. Figs. 7 and 8 are examples of this.

It becomes evident[6] that the new recommended values for many of the home tasks are not consistent with portable lamp performance or with

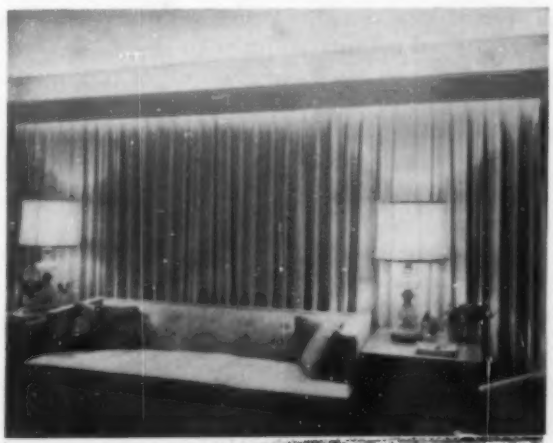

Figure 7. When installed, this attractive combination of valance, three 40-watt Homeline tubes and harp-type lamps with 150-watt, two-level bulbs meets the IES recommendation of 30 footcandles for casual reading. However, this level cannot be maintained beyond 40 per cent of the tubes' lives, nor can a lamp higher than 150 watts be used in the high transmission shades.

Figure 8. Niche arrangement is ideal for establishing, with low brightness ratios, the current recommended footcandle values. Here, for machine sewing and studying, there are 250 fc at sewing machine needle, 80 fc maintained over study area. Lighting is by 75-watt R30 floods in reflectors, 100-watt two-level lamps in wall portables and, mounted above front edge of shelf, two rows of two 30-watt Homeline tubes with reflectors. Decorative recess produces no measurable light on planes.

current progress in the lighting of homes. There is no doubt that these values can be obtained, as indicated above, or that they do offer stimulation for advancement in lighting and in equipment design. However, they appear unrealistic from the standpoint of "the great majority" of families or homes today. One is forced to conclude that a realistic recommendation at this time would restate the new illumination levels of residences as average, including possibly a maintenance factor, rather than as "minimum on the task." Recommendations for allowable footcandle variations on the specified planes[1,5] might be a criterion.

Conclusion

The new design, which operates in all three-way switching sockets, virtually eliminates dissatisfaction caused by the occurrence of half-dead lamps. It provides the basis for a multiple-filament design with a more uniform useful lamp life, because the life is based on the major filament, as in a single-filament lamp.

The ratio of light output of the high and low levels is substantially greater than that of the individual steps in the three-level lamp. Thus, selection of the level designed for visual activity or for relaxing periods is much simpler and more clear-cut. The design improves the high level efficiency 14 to 20 per cent. This is the order of difference in the average illumination on task planes, lighted by well-engineered portable lamps using three and two-level lamps.

Illumination gains of this order represent significant progress. However, the great gap still existing between minimum illumination on task planes and the current IES recommended levels, even when recommended general illumination is added, points up the need for restudy and better interpretation of new IES levels.

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DISCUSSION

H. S. BEAGLE:* Of recent years, the portable lamp has become the principal source of light for living quarters of the average American family. Anything that would make it possible to approach recommended illumination levels for reading and other visual tasks is a marked advantage. The 14 per cent increase in lumen output of the new two-level lamp over the old three-way lamp is therefore worthwhile progress.

In the CLM lamp type, with which we have the greatest recent experience, full advantage of the increased light output from the two-level lamp is obtained in footcandles on the reading plane, compared to the older three-way lamp, without exceeding the brightness limits that have been established for this lamp to assure visual comfort. In other words, the use of the new lamp in the CLM type of portable offers distinct advantages.

ETL tests of two-level lamps have more or less verified the results reported in the paper. As a matter of fact, we have secured somewhat higher values than those reported for the average footcandle level on the test plane.

It is interesting to note that using the CLM lamp, other things being unchanged, the three-level lamps in today's white finishes, according to our findings, show an increase in illumination on the test surface of about six per cent over that of these same lamps with inside-frost finish, with the

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value decreasing for light center lengths greater than 3⅞ inches for the medium base lamps and 3¾ inches for the mogul base lamps—these light center lengths being the ones relative to which the glass diffusing bowl designs and the positioning of sockets and socket covers for CLM portable lamps were determined some 15 years ago.

During the latter part of the IES certified lamp program, the use of a disc under the shade, as an alternative to the open-top diffusing bowl, was proposed and demonstrated by ETL, but this alternative approach was not accepted. We believe this idea holds promise and is worthy of further investigation.

JAMES J. MCGEENEY:* The development of the series connected filament for multiple filament lamps must be considered a basic improvement in lamp design.

The authors' analysis by comparison of two-level and three-level lamps leaves little doubt as to the accuracy of this first point. However, by going one step further in that comparison some of the advantages of the two-level lamp may be enlarged upon.

First, on the basis of the authors' figures, we must agree that the two-level lamp is the more efficient. It will eliminate user complaints of "premature" single filament failure; it provides a moderately useful load building tool for the electric utility; it takes a first step toward bringing residential levels nearer the IES recommended minimum lighting levels, using existing equipment.

Table 1-A compares the two-level and three-level lamps on the basis of high level in both lamps or, major filament only in the two-level lamp as against major and minor filaments operating together in the three-level lamp. There is every reason to assume that in actual practice a valid comparison may be made by comparing the high level in the two-level lamp with the medium level in the three-level lamp or, stated more accurately, comparing major filament operation only in the two lamps. As stated above I believe this to be as accurate a criterion as the comparison of high level *vs* high level. In any event the results are very interesting and in reality go one step further in making even clearer the basic superiority of the two-level lamp. Table A is a somewhat revised Table 1-A, making this comparison. The third line in each section of the comparison is the high level of the three-level lamp as it appeared in the authors' table. Table 1-B of the paper will reflect these changes in the following manner: the 100-watt two-level lamp will show a 10 per cent efficiency increase; the 150-watt lamp, a 4 per cent increase; and the 300-watt lamp an 8 per cent increase in major filament efficiency. This compares to a 20 per cent, 14 per cent, 14 per cent respective increase in the straight high-level comparison.

Obviously, the two-level lamp's efficiency advantage begins to fade but it does not disappear even in this type of comparison. Further, the considerable drop in total lumens is a distinct disadvantage to the three-level lamp if we are to assume that the average user will choose the average or median level in this three-level lamp to perform his average visual tasks.

Assuming again that the three-level lamp is used in this manner even in a relatively small percentage of cases, the obvious advantage in the two-level lamp's load building potential now stands out. It is obvious that this may never be construed as an advantage to the user. However, the intrinsic advantages in efficiency and the elimination of half-dead lamps is more than enough to offset this slight disadvantage. Coupled with these advantages is the fact that the user is more or less forced to choose a level for more critical visual tasks which more closely approximates IES recommendations than does either of the higher levels in the three-level lamp.

The premise set forth in this paper, *viz.*, that the mid-level of the three-level lamp may be validly used for making comparison, is not an arbitrary conclusion. In this area the two-level lamp has been available to consumers for some time. The main user advantage—eliminating annoying single filament burnout—has been by far the outstanding advantage of the lamp from the user's point of view. There have been but two principal objections. The first of these objections may be pretty well summarized as a rather natural resistance to change of any sort, but the second has revolved around the fact that no middle or average burning level is available in the new lamp. In this fact lies at least part of the basis for the validity of the foregoing comparison. It is also of note at this point that merchandisers in general recoil at the idea of carrying both lamps on their shelves. It is to be hoped that a new socket will be marketed shortly which will provide a high-low-off switching sequence for the new lamp.

H. A. ANDERSON:* In going through the data presented in this paper, several points are questioned for clarification.

When the major filament burns out in the new lamp, the lamp becomes inoperative in a three-way socket. When the minor filament burns out, the high position will function. We understand, however, that this latter situation is not very likely since the minor filament is designed for very long life and is only burned in series with the major filament.

In conventional three-way lamps, when either filament fails, you have one filament remaining for some light. Many

*Interstate Power Co., Dubuque, Ia.

*Duro-Test Corporation, North Bergen, N. J.

TABLE A—Comparison of Two-Level and Three-Level Lamps

Watts	Type	LPW	Lumens	Watts	LPW	Lumens	Watts	LPW	Lumens
100	2-level	15.2	1520	51	7.0	355	76	12.4	937
70	3-level	13.8	965	30	9.8	295	50	12.6	630
*100	3-level	12.6	1260	30	9.8	295	65	12.0	778
150	2-level	16.2	2430	70	8.3	580	110	13.7	1505
100	3-level	15.5	1550	50	11.8	590	75	14.3	1070
*150	3-level	14.3	2140	50	11.8	590	100	13.6	1365
300	2-level	17.5	5250	135	9.6	1300	218	15.0	3275
200	2-level	16.2	3240	100	13.7	1370	175	15.3	2305
*300	3-level	15.4	4610	100	13.7	1370	200	15.0	2990

*Denotes high level operation of three-level lamp.

customers may still feel that for safety reasons some light is better than none until the lamp can be replaced.

We have found through the years that a very high percentage of three-way lamp complaints have been due to faulty contact when lamps are installed. If the lamp is not properly seated in the socket, either the bottom contact or the ring contact is not properly made, resulting in only one level of light. Many three-way lamps are discarded prematurely for this reason. We are interested in knowing how the new two-level lamps will act under these conditions.

When the new two-level lamp is placed into a single contact socket, the lamp will operate in the "low" position. Although this practice is not recommended for this lamp, or the previous three-way lamp, unfortunately such operations do occur in residential lighting. In the case of the new two-level lamp, the "low" position will result in higher wattage consumption for relatively low light output.

When the new lamps are used in the "low" position, the customer will be consuming about 35 to 40 per cent more electrical energy for approximately the same light level as is obtained from the "low" position on conventional three-way lamps.

Since this "low" position would be quite often used for television viewing, it could represent a very popular usage of lamps since television is viewed for at least several hours a day in most homes. In this case exceptionally higher wattage would be consumed for relatively low light output, as compared to three-way lamps.

N. J. Rainone:* It is true that all lamp manufacturers are concerned with the annoyance to the user of half-dead lamps. The two-level design may overcome part of this problem but it is far from adequate.

In a recent survey, we asked one of the major electric utilities to accumulate all three-way lamps brought back by their customers. After a period of time an analysis of these lamps showed that 50 per cent had both filaments burned out, 30 per cent had one filament burned out (with normal life indicated in most cases for the burned out filament) and 20 per cent had both filaments intact.

The 20 per cent with both filaments intact as well as the 30 per cent with one filament burned out were returned as half-dead lamps. The trouble in 20 per cent of the complaints was the poor contact to the ring connection in the socket which, had the customer known, could have been corrected by a slight turn of the lamp in the socket.

To further confirm the ring contact problem, we purchased 100 new mogul three-way sockets and placed a lamp in each. When turned on, thirty lamps did not light on both filaments until an additional twist was given to further tighten these lamps in their sockets. The two-level lamp depends upon the ring contact for the high-level light, and therefore will still encounter this major source of complaint.

The rather high wattage and low efficiency at the low level of the two-level lamps seems to us to be counter to one of the main reasons for using two- or three-way lamps. The high level is necessary for exacting visual tasks. When the high level is not needed people most often turn to a lower level to save electric power. The authors argue that the two-level design gives 14 to 20 per cent increase in efficiency at the high level. This comparison is made with lamps using the less efficient single-wound coils. It seems to us that the new design coiled coil three-way lamp is the more desirable answer because it has high efficiency in all three levels and provides maximum flexibility.

Another source of complaint is bound to come from two-level lamps when used in existing three-way sockets, as proposed in the paper. Through the years we have gotten accustomed to the progressive increase (and at times decrease) in light when switching through the three levels, and then to the off position. It will take a lot of convincing to make Mrs. John Doe believe that nothing is wrong with a bright-dim-bright-off cycle.

G. J. Edwards and M. E. Webber:* The authors wish to thank the discussers for their interesting comments. Mr. Beagle and Mr. McGeeney were especially helpful in their testing and analyzation of the new design.

Mr. Anderson points out some characteristics of the two-level lamp and its application upon which comment may be useful. We believe that most people use a multiple-level lamp because of its convenience, in rooms in which other light sources are usually available, rather than because they consider a second filament to be a reserve "safety light." If the lamp is not seated properly in the socket, the three-level lamp loses both its highest level and one of its other levels when either the ring or eyelet contact is lost. The two-level lamp loses its high level only if the ring contact is lost. The fact that the two-level lamp will operate at only the low-level in a socket designed for a single-filament lamp encourages selection of the economically correct lamp type. For predominantly low-level operation, a single-filament lamp of the proper wattage is certainly more efficient and less expensive initially.

Mr. Rainone makes a point worth emphasizing when he comments upon the increased efficiency of a double-coiled filament. It is of interest that in the highest output level of the 50/100/150-watt three-level lamp, for example, a change of both filaments from single coiling to horizontal double coiling improves the average efficiency up to five per cent, while changing the single-coiled filament lamp from a three-level to a two-level design improves the efficiency 14 per cent. Applying the two-level design to the coiled-coil lamp should provide a similar increase in efficiency. Our examination of lamps returned to utilities for free renewal also found a fairly large percentage (about 15 per cent) in good operating conditions. Six per cent apparently would not contact the socket as a result of uneven solder height or defective sockets. There appeared to be no good reason for the return of the other nine per cent. This would imply that either sockets or switches were malfunctioning and would underline the need for any improvement in these parts which can be obtained.

In the actual application of the lamp, many lighting specialists feel that an increasing number of people turn to the low level, not to save money when visual activity is not being performed, but to obtain environmental effects more suited to mood and to inactivity.

*Westinghouse Electric Corp., Bloomfield, N. J.

*Authors.

LIGHTING NEWS

IES National Technical Conference—1960

If there were any post-mortem's on planes out from Pittsburgh, they must have gone something like this:

- Wasn't it great having a whole floor of the hotel just for the IES Conference —committee meetings and everything?
- Did that guy Chuck Conklin ever go to bed? I passed his Conference headquarters place at seven a.m. and he was there even then.
- That conference job—you can't thank them enough, and that's a fact.
- If you ask me, something is going to have to be done to allow more time for discussion of the Conference papers.
- Why do they always put the two parts of the Lighting Competition in parallel meetings? I want to see both.
- Those papers listed as "application papers" weren't *my* idea of lighting application papers. Not all of them, anyway.
- That corporate meeting they have at the opening session now is a great idea.

Annual Report

The corporate meeting is, indeed, a valuable part of the Conference opening session. In adidtion to individual reports by the Society's officers, this session now includes the Society's Annual Meeting with some 700 or 800 members participating. The officers fielded a great many pertinent questions from the floor, so many the schedule finally curtailed more. Full reports of President J. B. Browder and President-Elect R. G. Slauer, as given at the Conference, appear in print in the September issue of IE. General Secretary G. F. Dean's report will be published in the December issue. This latter is a detailed statement on all of the Society's work, its membership statistics, and includes financial sheets for the 1959-1960 fiscal year.

Technical Sessions

Thirty-eight papers were presented at this year's Conference, one of them an invited paper by J. B. de Boer of the Netherlands. (For complete program see page 14A). There is some question now as to whether this is too many papers, whether there should be fewer papers, or more parallel sessions with fewer papers per session, or both—especially if discussion must be curtailed to keep things on schedule. Enough frustration was expressed by would-be discussers to place this problem before Council on September 16. A study will be made before next year's Conference, leading to a solution.

Not included in the 38 technical papers on the program was a very stimulating three-paper session arranged and conducted by the national Residence Lighting Forum Committee. Over the years this has grown to be a major event of the Conference. Details of this are also included in the complete program.

IES Applied Lighting Competition

An important sense of professionalism was felt in the Competition this year. It's new name, for one thing, more accurately describes its nature, and has apparently succeeded in establishing an "image" more in keeping with the stature of this important Society/Industry project. More consulting engineers and architects among the IES membership, as well as a variety of utility and manufacturers' specialists were entered in competition. Both first prize winners, it happened (see below), are independent consulting engineers.

Whether its new name, new rules and the excellent organization developed by J. Carl Wilson, Competition Committee Chairman, were responsible, it was obvious in 1960 that the IES Applied Lighting Competition is very Major League, indeed. To follow this analogy further, the national competition between the "pennant winners" from the Section, then the Regional Competitions, could well be considered the "world series" for lighting installations. Here's how it turned out in 1960:

CLASS I—RESIDENTIAL

First Prize ($100)—Sylvan R. Shemitz, Connecticut Section, Northeastern Region.

Second Prize ($50)—Jack T. Cottingham, Oregon Section Pacific Northwest Region.

Third Prize ($25)—Robert Haskell, Golden Gate Section, South Pacific Coast Region.

(*Continued on page* 10A)

Conference Statistics

Date: September 11-15, 1960
Place: Penn-Sheraton Hotel, Pittsburgh, Pa.
Chairman: Nelson C. Warner

ATTENDANCE

Delegates	612
Ladies	164
Total	776
Banquet	580

Attendance Award Winner: New Orleans Section

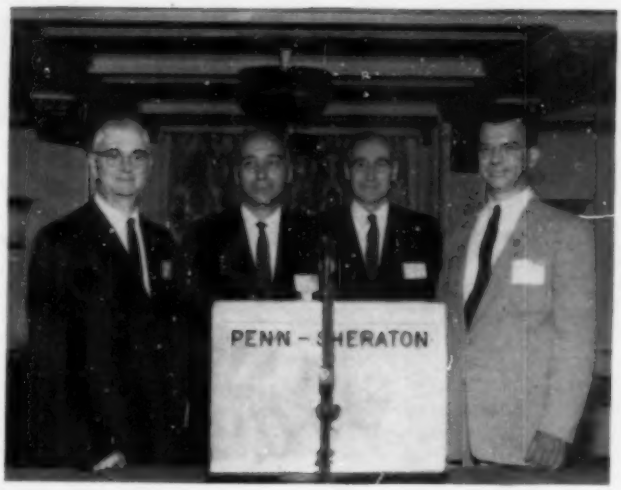
Society's highest honor—IES Gold Medal was presented to Willard C. Brown (left) by President J. B. Browder. J. F. Whitehead, Jr., Chairman of the Medal Award Committee smiles his approval.

HIGHLIGHTS OF 1960 IES

Five of six new IES Fellows received white lapel pins, symbol of Fellow Grade. Left to right: G. B. Buck, Charles A. Douglas, Phelps Meaker, E. B. Noel, R. G. Williams. Missing is Philip F O'Brien, Southern California Section.

Two photos above are of the enormously successful Sustaining Member Luncheon. At top, left to right at the head table: A. D. Hinckley, A. F. Wakefield, M. I. Allen (speaker), G. J. Taylor (Sustaining Membership Committee chairman), President Joe B. Browder, President-Elect Richard G. Slauer, C. L. Crouch.

Residential Industry Luncheon, a conference tradition. Photo above, head table of past and current leaders of the IES Residential Lighting Forums. Photo below, some of the luncheon crowd.



Opening session participants, photo at left, l. to r.: G. F. Dean, General Secretary; J. B. Browder, President; R. G. Slauer, Vice President; C. L. Amick, Conference Committee Chairman. Below: Presidential inauguration of R. G. Slauer who now holds gavel.

NATIONAL TECHNICAL CONFERENCE

Judging Allied Arts contest (winner to show at CIE in Vienna) are l. to r.: Carl Long, consulting electrical engineer; R. H. Burdett, Carnegie Institute of Technology; C. S. Ingham, president, Pittsburgh, AIA; W. M. C. Lam, Lam, Inc., Wakefield, Mass.; J. D. Whitnell, chairman Allied Arts Committee.

President Browder (at right) greets foreign visitors to the Conference. Left to right, foreground: A. Kosak, Mexico; Dr. T. Harada, Past-President of Japanese IES who brought greetings from his Society; T. Iida, Japan; S. M. Radosavljevic, Yugoslavia. Back row: J. B. de Boer, Netherlands, who presented an invited paper; Eric Dunch, Bermuda.

Past Presidents' Luncheon. Seated around table, past and current IES Presidents, l. to r.: A. F. Wakefield, W. C. Brown, H. H. Magdsick, G. S. Crampton, R. G. Slauer, J. B. Browder, Ward Harrison, W. F. Little, Walter Sturrock, E. M. Strong Standing: S. G. Hibben, L. E. Tayler, K. M. Reid, G. J. Taylor, M. N. Waterman, S. B. Williams.

G. J. Segel (right), Chairman of the New Orleans Section receives gavel and anvil award for highest section attendance in terms of number of miles travelled. Making the presentation is President Joe Browder.

(Continued from page 7A)

Fourth Prize ($15)—Alfred Makulec, Cleveland Section, Great Lakes Region.

Runners-up—M. William Downey and Walter G. Perram, Arizona Section, Intermountain Region; John D. Hilburn, Jr., Heart of America Section, Midwest Region; Edna P. Fortier, New Orleans Section, South Central Region; Ruth Morris, Georgia Section, Southeastern Region; Maxine Briggs, Central Oklahoma Chapter, Southwestern Region; Albert Fox, Capital Section, East Central Region.

Judges: Elizabeth A. Meehan, Mary B. Taepke, C. W. McCormick.

CLASS II—COMMERCIAL

First Prize ($100)—Louis N. Goodman, New Orleans Section, South Central Region.

Second Prize ($50)—William McCarthy, Western New York Section, Great Lakes Region.

Third Prize ($25)—R. E. Buell, Bluenose Chapter, Canadian Region.

Fourth Prize ($15)—D. Dana Price, San Jacinto Section, Southwestern Region.

Judges: M. N. Waterman, J. J. Neidhart, R. W. Morris; *Teller and Secretary:* J. D. Whitnell.

Installations winning the four top prizes are presented in this issue, starting on page 571. In addition to the cash awards given for the top four places in each class, first prize winners received miniature silver replicas of the Goddard Cup, and their names will be engraved on the Trophy itself.

Awards

Gold Medal

Highest honor the Society can bestow is its Gold Medal and Certificate for especially meritorious achievements in illumination. This was awarded at the opening session, September 12, to Willard C. Brown (see September IE, page 7A). Mr. Brown's acceptance address is recorded on page 22A of this issue.

Fellows

Five of the six new Fellows of the Society were present to receive the coveted white Fellow lapel pin, presented by President Browder at the opening session. A report on the distinguished work of these six members leading to this honor was given in the September IE, pages 9A and 10A.

Other Awards

There are several awards which are annually an interesting part of the Conference, some of them more traditional than official.

Attendance Gavel—This is a Section/Chapter award presented each year to the Section/Chapter having the greatest number of members present at the Conference, in percentage of the Section's total membership and the miles traveled. The winning Section holds it for a year, and the name is engraved on the silver trim. The gavel is now also accompanied by an anvil presented by the British Columbia Section. Holder of the gavel-anvil for 1960 is the New Orleans Section. In second place in this attendance contest was the Southern California Section, with Palmetto third.

Ketch Gavel—This is a charming tradition some four years old now. It is a handsome gavel turned by hand by retired-Member James M. Ketch, from beech wood grown on the tree farm of Past-President Kirk M. Reid. Design and size of the gavel is identical to that used in the U. S. Supreme Court. It is presented by Mr. Ketch to the retiring IES President as a memento of his presidential year. These gavels are now held by Past-Presidents J. B. Browder, George J. Taylor, Kirk M. Reid and Marshall N. Waterman. Presentation to Past-President Browder this year was made during a ceremony at the Council Meeting held in Pittsburgh on September 16.

Goddard Cup—This has already been mentioned (see Applied Lighting Competition). Donated by Past-President Charles H. Goddard (1949-1950), this is a beautiful silver cup awarded to first prize winners of the Applied Lighting Competition. Their names are engraved on the cup each year, displayed at Headquarters, and miniature replicas are taken home by the winners.

Law Cup—This is a golf award presented to the Society by Clarence L. Law, President of the Society, 1923-1924. It is placed in competition at each National Conference for individual score on an 18-hole handicap basis. The winner's name is engraved on it each year, and a replica presented for his permanent ownership. This year's handicap winner was A. J. Sharkey, Westinghouse Electric Corp., Fairmont, West Virginia, with a gross score of 109 minus a 63 handicap, for a net of 46. Low gross was shot by George Page, Thompson Electric Co., Cleveland, with a score of 76.

Regar Cup—Another golf award presented to the Society by President G. B. Regar (1936-1937) is for Section/Chapter team competition. The winner in 1960 was the Pittsburgh Section, with a total gross score of 358 by a team composed of Mark H. Wainright, G. H. Kuhlmann, E. S. Kelly and James A. Hodges.

Special Events

Sustaining Member Luncheon

Success of the Society's program for lighting research (through IERI) may well depend on the success of the Sustaining Member program. Starting point for a campaign in this direction, conducted by George J. Taylor, S-M Chairman, was a special luncheon at the Pittsburgh Conference for Sustaining Members' representatives. About 130 people attended on Tuesday, September 13.

The event was a great success. It may well start another valuable IES tradition. Future Sustaining Member Luncheons have already been endorsed as an annual event at the National Technical Conference, and plans for the Second S-M Luncheon are now under way for the week of September 24, 1961 in St. Louis.

Chief speaker at the Sustaining Member Luncheon was M. I. Allen, Vice-President of Philadelphia Electric Co. His dynamic address "Cracking the Light Barrier" emphasized the direct return (in increased sales) of dollars contributed by industry to lighting research. Impressive charts graphically demonstrated this relationship of knowledge and business return. His address included lists of IERI researches now planned, for which funds are needed; the chief source of these funds being the IES Sustaining Member program which has recently undertaken further financing of the Illuminating Engineering Research Institute.

Following Mr. Allen's provocative address, a panel of experts answered questions from the floor, giving further and specific information on this urgent subject. Panel for the meeting:
J. B. Browder, Sales Manager of Georgia Power Co., Atlanta, and 1959-1960 President of IES; R. G. Slauer, Manager of Engineering, Sylvania Electric Products Inc., Wheeling, West Virginia, and 1960-1961 President of IES; A. F. Wakefield, President, The Wakefield Co., Vermilion, Ohio and Chairman, Board of Trustees, Illuminating Engineering Research Institute; G. J. Taylor, Vice-President, Day-Brite Lighting, Inc., St. Louis, Missouri and Chairman, IES National Sustaining Membership Committee.

Progress Report

This is ever a Conference highlight. It requires the hotel's largest ballroom and even then early arrivals are the only ones seated. This year's Report was as spectacular as ever, starting off with fanfare (literally) to herald the entrance of a splendid "King and Queen" in royal robes, tied in with "Renaissance in Lighting," theme of this year's show. "King," of course, was Max Strang of Toronto, Chairman of the Progress Committee, and his helpful court was made up of the hard-working members of this committee.

Minus the panoply, but interesting nevertheless, the 1959-1960 Progress Re-

(Continued on page 14A)

IES APPLIED LIGHTING COMPETITION

Cups running over, Goddard Trophies that is, to Sylvan R. Shemitz (center), first prize, Class I—Residential and Louis N. Goodman (right), first prize, Class II—Commercial, from President Browder.

At right—Class I contestants. Seated, Maxine Briggs, Roy Kreyser (proxy for Robert Haskell), Al Makulec, Ruth Morris. Standing, Al Fox, Sy Shemitz, John Hilburn, Jack Cottingham, Walt Perram, G. J. Segel (proxy for Edna Fortier). Above, judges, l. to r.: Elizabeth Meehan, Mary Taepke, C. W. McCormick.

Class II contestants, photo at left, front row: l. to r.: Gordon Buzan, Robert Chin, A. G. Anderson. Second row: Burton Benjamin, W. Arbetter, Joe Thomas (Chairman), Dana Price. Back row: Armand Zitelli, Louis Goodman, Barney Best, Rod Buell, Bill McCarthy, Bruce Thyberg. Judges, (above) seated: M. N. Waterman, J. J. Neidhart, R. W. Morris. Standing, J. D. Whitnell, teller.

Sylvania's 2'-wide Troffers provide attractive, glare-free lighting in the general and private offices. Sylvania's pendant and surface-mounted fixtures illuminate other building areas.

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Robertshaw-Fulton Controls Co., New Stanton, Pa.
Engineers and Constructors—
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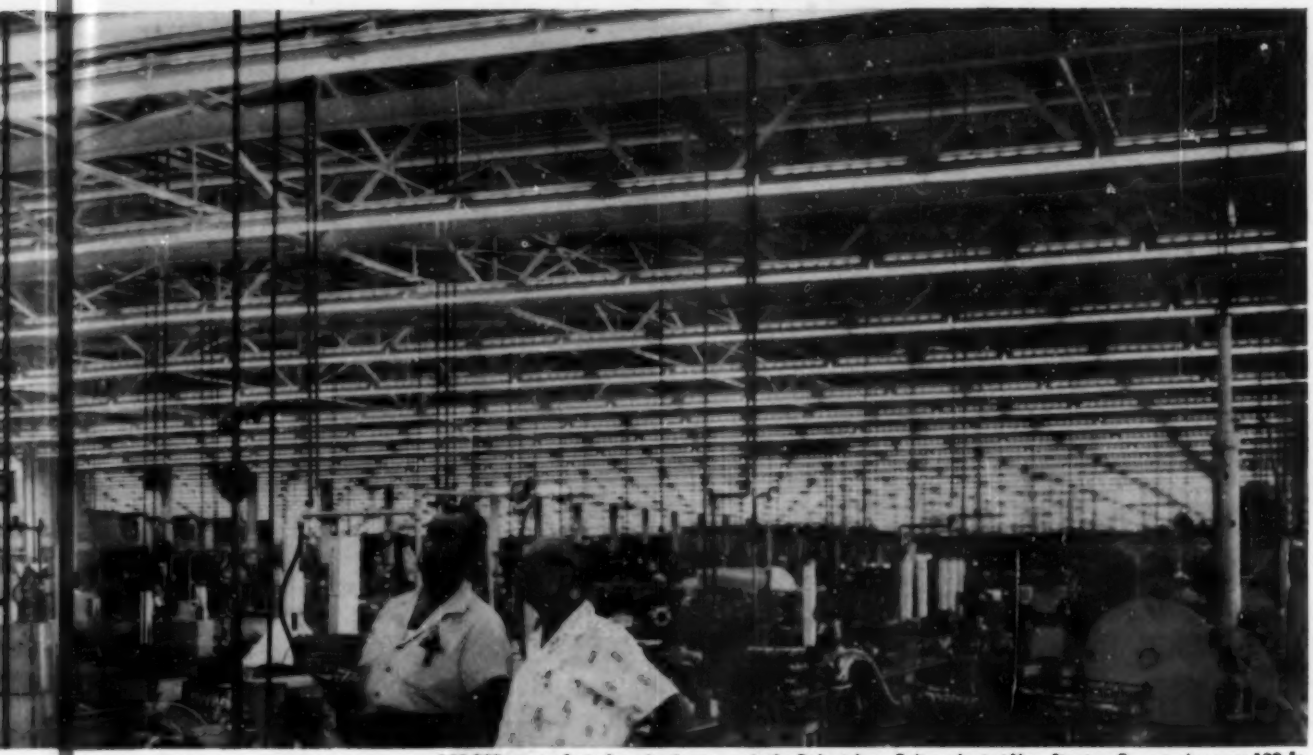
Electrical Contractor—
Allegheny Industrial Electrical Co., Inc., Pittsburgh, Pa.



222,000 square feet of production space in the Robertshaw-Fulton plant at New Stanton, Pa., receive over 120 *fc.* of lighting from more than 1500 Sylvania Very High Output fixtures. Mounting height-17 ft., spacing-20 ft.

LIGHTING AIDS PRECISION PRODUCTION

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output fixtures with 1500 ma lamps provide 120 foot-candles of even comfortable illumination.

The general office, cafeteria and private offices utilize Sylvania's 2′-wide Troffers with diffuse glassware shielding for pleasant, glare-free lighting.

Still other parts of the building use different Sylvania lighting equipment. The lobby and reception area features Sylva-Lume, one of Sylvania's modular lighting systems. In the Research Department Sylvania's Tartan fixtures provide the right answer. And in certain low-ceilinged areas the choice was Sylvania's shallow surface-mounted Mohawk fixtures.

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COMMITTEE members Alex Hunter (seated left, photo at left) and J. S. Frizzel (seated right) man the Anchors Aweigh booth. Standing behind them, C. A. Conklin (facing camera), reception committee chairman and Bob Brandfass (back to camera). At right: "Boots" Frizzell sells Anchors Aweigh ticket to George Gill of Miami.

(Continued from page 10A)

port on new lighting developments will be presented in print in the January issue of IE.

Residential Lighting Forum
Industry Luncheon

Another luncheon event on September 13 was the annual gathering of men and women interested especially in residence lighting. Some 50 attended. Chairman for this event was Miss Emma Koch, West Penn Power Co., Greensburg, Pa. The luncheon preceded the full-afternoon session planned by the Residence Lighting Forum Committee, Eve Freyer, Chairman. In her absence, chairman for the session was Miss Ruth Morris, Georgia Power Co., Atlanta. Three papers were presented (see program details, page 19A).

President's Luncheon

Another perennial—a get-together of Past-Presidents of IES and their two incoming members. Fourteen Past-Presidents attended at Pittsburgh. In addition to the two neophytes, J. B. Browder and R. G. Slauer, there were: Willard C. Brown; George S. Crampton; Ward Harrison; S. G. Hibben; W. F. Little; Herbert H. Magdsick; Kirk M. Reid; Everett M. Strong; Walter Sturrock; Lee E. Tayler; George J. Taylor; A. F. Wakefield; Marshall N. Waterman; and Samuel B. Williams.

Social Events

Social highlight of the whole IES year is the President's Reception and Banquet. This year's honored President and Mrs. J. B. Browder. The gift presented to them by the Pittsburgh Conference Committee as a memento of their year was beautiful Pittsburgh produce—a complete set of glasses in various sizes, with pitchers to match.

The banquet was at the end of the week. At the beginning of it, on Sunday evening, was another brilliant affair—a reception given by the Pittsburgh Section.

Less formal but a big part of the social program was the "Anchors Aweigh" outing Wednesday afternoon. All technical business ceased for this. The entire Conference sailed in chartered cruisers up the Monongahela and Allegheny Rivers, through the Allegheny river lock, to a chicken barbecue at the Oakmount Yacht Club. Return trip was at dusk, ending with a breathtaking nighttime view of the New Pittsburgh and its Golden Triangle.

For Ladies Only

All of these affairs were for the ladies, of course. *Just* for them, however, were several additional excursions.

- Continental breakfast together every morning. Hostesses with maps, here, to chart the day.
- Guided tour of the fabulous kitchens of Heinz "57 Varieties" plant.
- Luncheon and hat show, at Adams House at Adamsburg, Pa. Buses, and good organization, speeded this.

1960 Conference Sessions

September 12

Preliminary Session

Presiding—C. D. Miller, Vice-President, East Central Region

Opening Session

Presiding—Charles L. Amick, Chairman, National Technical Conference Committee.
National Officers Report
President—Joseph B. Browder
General Secretary—G. Franklin Dean
President-Elect—Richard G. Slauer
Introduction of Fellows, 1960
IES Medal Award—Report by J. F. Whitehead, Medal Award Committee, on Medal Award to Willard C. Brown.

Research I Session

Chairman—Kurt Franck, Holophane Co., Inc., Newark, Ohio.
Discussion Organizer—R. D. Bradley, Day-Brite Lighting Inc., St. Louis, Mo.
Application of Sodium Lamps to Public Lighting—J. B. de Boer, N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands.
Measurement of Visual Information Cues—H. L. Logan, E. Berger, Holophane Co., Inc., New York, N. Y.

Applications I

Chairman—Benjamin S. Benson, Jr., Thomas Industries, Inc., Benjamin Division, Des Plaines, Ill.
Discussion Organizer—W. F. Crosby, Corning Glass Works, Corning, N. Y.
Darkroom Lighting Systems—Herbert S. Glick, Eastman Kodak Co., Rochester, N. Y.
Progress in the Development and Application of Static Converters for High Frequency Fluorescent Lighting—W. H. Johnson, Westinghouse Electric Corp., Cleveland, Ohio.
Lighting of Airport Service Areas—E. B. Karns, Westinghouse Electric Corp., Cleveland, Ohio.
Design and Performance of an Inset Runway Light—Charles H. Loch, Westinghouse Electric Corp., Cleveland, Ohio.

September 13

Research II

Chairman—C. M. Cutler, General Electric Co., Nela Park, Cleveland, Ohio.
Discussion Organizer—J. J. Neidhart, The Miller Co., Meriden, Conn.
BCD Appraisals of Luminaire Brightness in a Simulated Office—Willard Allphin, Sylvania Electric Products Inc., Salem, Mass.
Further Data on Discomfort Glare from Multiple Sources—S. K. Guth and F. P. McNelis, General Electric Co., Cleveland, Ohio.
A Portable Reflectance Meter—A. Hadley Taylor, Retired Physicist, East Cleveland, Ohio.

Light Sources I

Chairman—J. L. Cox, Duro-Test Corp., North Bergen, N. J.
Discussion Organizer—A. W. Weeks, Champion Lamp Works, Lynn, Mass.
Design of Fluorescent Lamps for Photoduplicating Service—C. J. Bernier, Sylvania Electric Products Inc., Danvers, Mass.
Ceramic Multilayer Multicolor Electroluminescent Lamp—Ivan E. Buck, Jr., Westinghouse Electric Corp., Bloomfield, N. J.

(Continued on page 19A)

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This is the embodiment of a design philosophy . . . a blending of function with aesthetics . . . an imaginative application of appropriate materials and manufacturing processes to good lighting. The product is *Prismalux*, a handsomely proportioned fully luminous form which cuts glare, reduces brightness contrast to minimum. The optically engineered prismatic lens directs controlled illumination downward. Diffuser sides provide soft peripheral lighting on ceiling areas, adding visual comfort. Both lens and

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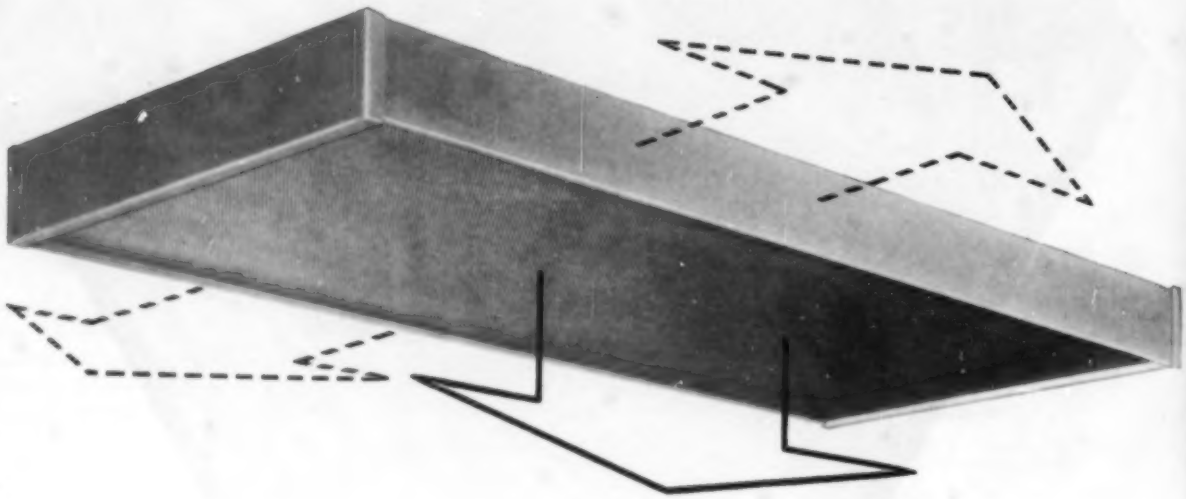

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Prismalux is stocked by these Authorized LIGHTOLIER Distributors:

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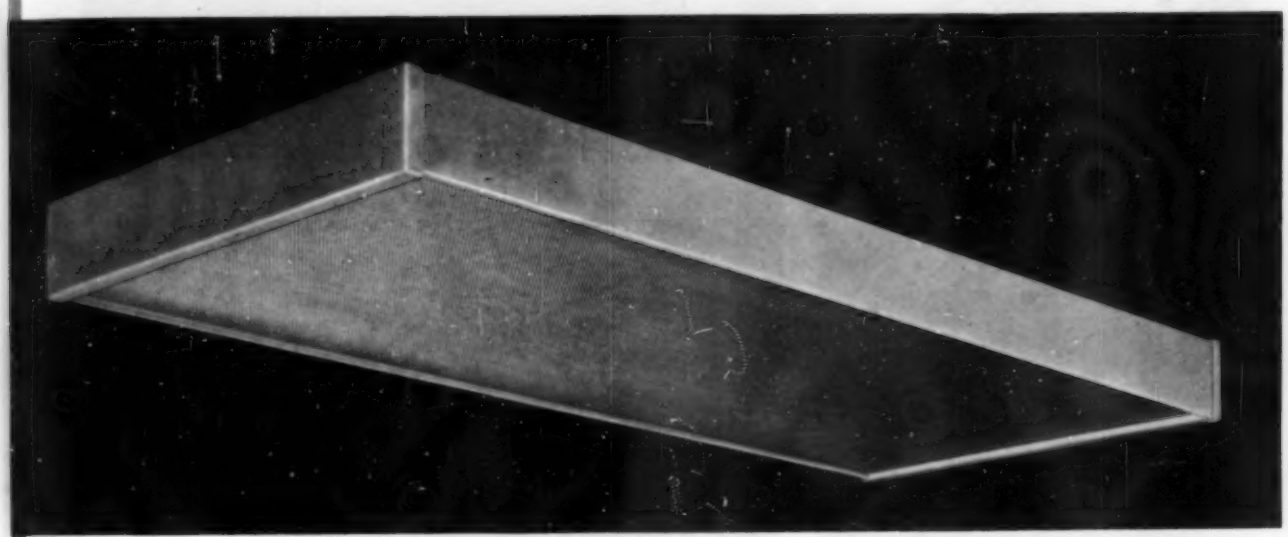
sides are molded of styrene or Plexiglas into a single, sturdy unit for clean appearance, rapid installation, simple upkeep. Safety hinges along full length permit easy access from either side, prevent accidental dislodging. The result: a fluorescent fixture ideal for schools, offices, stores, or any application where crisp styling is desirable, efficiency is required, good lighting is essential. You may specify Prismalux either stem or surface mounted, in four or eight foot lengths, in two, three or four light widths.

CRITICAL APPLICATIONS



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Pittsburgh:
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Argo Lite Studios
Brown & Green
Wally Elec. Sup. Co.
Reading:
Coleman Elec. Co.
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Pioneer Electric Dist.

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Anthracite Elec.

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Pawtucket:
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Ft. Worth:
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Southern Electric Supply Co.
San Antonio:
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Union Electric Sup. Ltd.
Quebec City:
La Cie Martineau Electric Co.
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Revere Elec. Dist.
Toronto Ltg. Studios

Below: A gift to President and Mrs. Browder from the Pittsburgh Conference Committee, presented by Chairman Nelson Warner (right). Right: At President's Reception, l. to r., Max Strang, Willard Brown, Mrs. Brown, Mrs. Guth, J. B. de Boer, Dr. S. K. Guth.

SOCIAL HIGHLIGHTS

Anchors Aweigh Outing. Above left, boarding the cruiser; above right, watching the barbecue; below right, lining up for the barbecue.

Seen here with President Browder in Nova Scotia tartan tam, one of the several Maritime members attending the Conference, H. Douglas MacMackin (right) in New Brunswick tartan.

NEXT YEAR "Meet Me In St. Louis," says Brooks Chassaing, Midwestern RVP, doing some campaigning for 1961 National Technical Conference.

(*Continued from page* 14A)

Multilayer and Flexible Single Layer Electroluminescent Lamps—Robert J. Blasek, Robert W. Wollentin and Hans B. Bullinger, Westinghouse Electric Corp., Bloomfield, N. J.

A New Two-Level Lamp for Residence Application—George J. Edwards and Mary E. Webber, General Electric Co., Cleveland, Ohio.

Developments in Quartz Infrared Lamps—William F. Hodge, General Electric Co., Cleveland, Ohio.

Residence Lighting

Industry Luncheon

Chairman—Emma Koch, West Penn Power Co., Greensburg, Pa.

Sustaining Members Luncheon

Chairman—George J. Taylor, Day-Brite Lighting, Inc., St. Louis, Mo. Chairman, Sustaining Members Committee.

Cracking the Light Barrier—M. I. Allen, Vice-President—Sales, Philadelphia Electric Co., Philadelphia, Pa.

Residence Lighting Forum

Presiding—Ruth Morris, Acting Chairman, Residence Lighting Forum Committee.

Large Luminous Elements in Residential Design—James H. Jensen, General Electric Co., Nela Park, Cleveland, Ohio.

Lighting Go-Round for the Sixties—Elizabeth Meehan and Bernard J. Esoda, Philadelphia Electric Co., Philadelphia, Pa.

Lighting Hudson Department Store Model Rooms—Mary Taepke, Detroit Edison Co., Detroit, Mich.

Light Sources II

Chairman—O. B. Goldsmith, Westinghouse Electric Corp., Bloomfield, N. J.

Discussion Organizer—Charles Elliott, Smithcraft Corp., Chelsea Mass.

40-Watt Fluorescent Lamp with Higher Light Output—Donald D. Hinman and Robert S. Fox, General Electric Co., Cleveland, Ohio.

Interflections in Aperture Lamps—Domina E. Spencer, University of Connecticut, Storrs, Conn., and L. L. Montgomery, Sylvania Electric Products Inc., Salem, Mass.

Design and Characteristics of Aperture Fluorescent Lamps—C. L. Toomey, Sylvania Electric Products Inc., Danvers, Mass.

Aperture Fluorescent Lamps—Applied—S. C. Peek, Sylvania Lighting Products Inc., Salem, Mass.

Calculations and Light Sources I

Chairman—T. C. Sargent, Sylvania Electric Products Inc., Salem, Mass.

Discussion Organizer—Fred E. Guth, The Edwin F. Guth Co., St. Louis, Mo.

Computer Programming for Controlled Fluorescent Lighting—L. L. Montgomery, Sylvania Electric Products Inc., Salem, Mass.

Color of High Pressure Mercury Lamps—C. W. Jerome, Sylvania Lighting Products Inc., Salem, Mass.

The Effect of Operating Position and Circuit Variations on Mercury Lamp Characteristics—Walter M. Waldbauer and Joseph A. Walick, Westinghouse Electric Corp., Cleveland, Ohio. Melvin C. Unglert and Hugh D. Frazer, Westinghouse Electric Corp., Bloomfield, N. J.

Design and Application of Outdoor Fluorescent Lamps—W. J. Karash and A. L. Hart, General Electric Co., Cleveland, Ohio.

Air Ions Using Ultraviolet Lamps—Rudolph Nagy, Westinghouse Electric Corp., Bloomfield, N. J.

Evening Session

Lighting Progress—Presiding—M. K. Strang, Curtis-AllBrite Lighting of Canada, Ltd., Chairman, Committee on Progress.

September 14

Applied Lighting Competition

Residential Lighting—Class I

Presiding—John M. Chorlton, Toronto Board of Education, Toronto, Ont.

Judges—Elizabeth A. Meehan, Mary B. Taepke, C. W. McCormick.

Great Lakes—Alfred Makulec, General Electric Co., Cleveland, Ohio. Cleveland Section. "High Footcandle Structural Lighting in a Residence."

Inter-Mountain—M. William Downey, Walter G. Perram, Jr., Arizona Public Service Co., Phoenix, Ariz. Arizona Section. "Dr. and Mrs. Monroe Shack."

Midwestern Region—John D. Hilburn, Jr., Boese Hilburn Electric Service Co., Kansas City, Mo. Heart of America Section. "The Contemporary and the Unusual."

Northeastern Region—Sylvan B. Shemitz, C. W. Mersick Electric Supply Corp., West Haven, Conn. Connecticut Section. "A Living Laboratory for Light for Living."

Pacific Northwest Region—Jack T. Cottingham, Portland General Electric Co., Portland, Ore. Oregon Section. "How to Live Happily—With Lighting."

South Central Region—Mrs. Edna P. Fortier, Lighting, Inc., New Orleans, La. New Orleans Section. "Ship to Shore."

Southeastern Region—Ruth Morris, Georgia Power Co., Atlanta, Ga. Georgia Section. "Relighting Cottage 14 (Georgia 4-H Club Center)."

South Pacific Coast Region—Robert Haskell, Pacific Gas & Electric Co., San Francisco, Calif. Golden Gate Section. "New Lamps for Old."

Southwestern Region—Mrs. Maxine Briggs, Hunzicker Bros., Oklahoma City, Okla. Central Oklahoma Chapter. "Lighting a Speculative Gold Medallion Home."

East Central Region—A. A. Fox, Washington, D. C. Capital Section. "Lighting Reception Area."

Commercial and Industrial Lighting—

Class II

Presiding—Joseph Thomas, Canadian General Electric Co. Ltd.

Judges—M. N. Waterman, J. J. Neidhart, R. W. Morris; *Teller and Secretary*, J. D. Whitnell.

Canadian Region—R. E. Buell, Northern Electric Co. Ltd., Halifax, N. S. Bluenose Chapter. "Shopping Center Restaurant."

Great Lakes Region—William McCarthy, Niagara Mohawk Power Corp., Buffalo, N. Y. Western New York Section. "Lighting the Amherst Lanes."

Inter-Mountain Region—Arnel G. Anderson, Arizona Public Service Co., Phoenix, Ariz. Arizona Section. "Guggy's Tower Plaza Coffee Shop."

Midwestern Region—Burton Benjamin, Revere Electric Mfg. Co. and Wallen S. Arbetter, Summit Electric Co., Chicago, Ill. Chicago Section. "Museum of Science and Industry."

Northeastern Region—Robert Chin, Chas. T. Main, Inc., Boston, Mass. New England Section. "Power Dam Control Room Lighting."

Pacific Northwest Region—Gordon F. Buzan, Royce Rich Electrical Consulting Engineers, Vancouver, B. C. British Columbia Section. "Lighting a Maritime Museum."

South Central Region—Louis N. Goodman, Goodman & Associates, New Orleans, La. New Orleans Section. "Lighting Main Concourse Moisant International Airport."

Southeastern Region—Barney P. Best, Healy & Latimer, St. Petersburg, Fla. Florida Section. "Anhaueser-Busch Hospitality House."

South Pacific Coast Region—Bruce Thyberg, Electrical Consultant, San Diego, Calif. San Diego Section. "Golden Opportunity."

Southwestern Region—D. Dana Price, Golemon & Rolfe, Houston, Texas. San Jacinto Section. "St. Theresa Church."

East Central Region—Armand Zitelli, Duquesne Light Co., Pittsburgh, Pa. Pittsburgh Section. "Municipal Building."

Afternoon Program

"Anchors Aweigh" and Chicken Barbecue—Oakmont Yacht Club

Golf Tournament—Edgewood Country Club

September 15

Roadway Lighting

Chairman—Thomas J. Seburn, Bureau of Highway Traffic, New Haven, Conn.

Discussion Organizer—H. E. Mason, Street Lighting Section, City Hall Annex, Philadelphia, Pa.

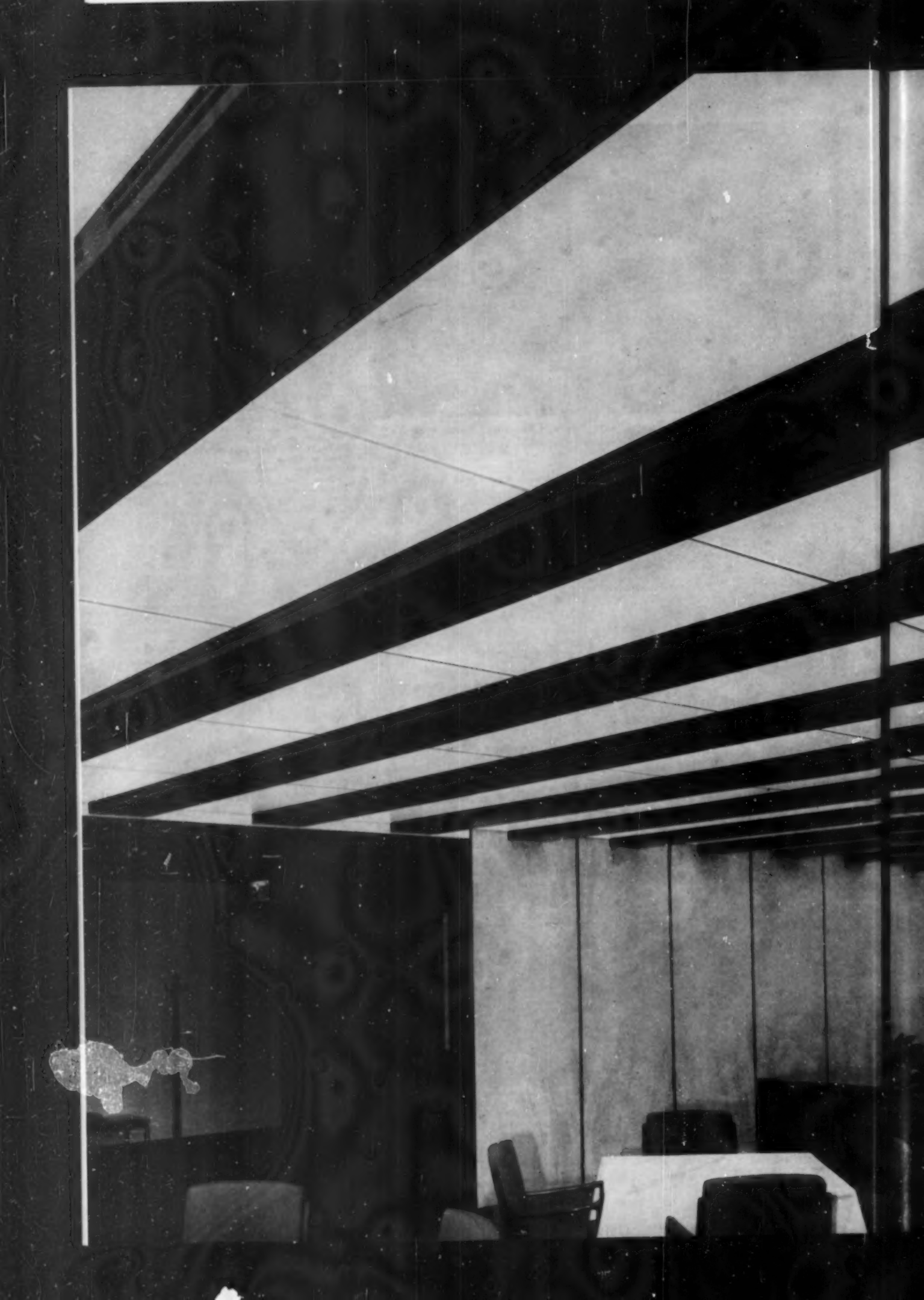
Research on Street Lighting Glassware Breakage—Harold A. Van Dusen, Jr., Line Material Industries, So. Milwaukee, Wis.

Roadway Brightness and Illumination As Related to Luminaire Distributions—Arthur W. Fowle and Richard L. Kaercher, Holophane Co., Inc., Newark, Ohio.

Factors Affecting the Efficiency of Street Lighting Systems—Harold A. Van Dusen, Jr. and Joseph C. Yaeger, Line Material Industries, So. Milwaukee, Wis.

Fluorescent Lighting for the High Speed Expressway—W. J. McCormick, Sylvania Electric (Canada) Ltd., Montreal, Que.

(*Continued on page* 22A)



Panels cast from Du Pont MONOCITE* provide soft, natural lighting in new Prudential Plaza Building

In the executive dining room and in the president's office of the Prudential Plaza Building, light-fixture panels cast from Du Pont MONOCITE assure good, evenly balanced lighting.

Softer illumination, together with freedom from maintenance problems, are given as major reasons for the recommendation of cast acrylic sheets by the interior architectural design firm of Maria Bergson Associates, which designed these areas. In the dining room, the ceiling design involves thirty-inch-wide plastic sheets cast from Du Pont MONOCITE, with wooden beams twenty-four and one-half feet long running between the panels.

The panels, cast by the Cast Optics Corporation, are designed to last the life of the lighting fixtures. They will keep their translucent beauty with only occasional cleaning with soap and lukewarm water.

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

The Plaza Building of Prudential Life Insurance Company of America, 736 Broad Street, Newark, New Jersey. Architects: Voorhees Walker Smith Smith & Haines, New York. Interior Architectural Designers for area shown: Maria Bergson Associates, New York, N. Y. Installation: Beach Electric Co., Inc. and Lightning Electric Service Company, East Orange, New Jersey.

Lighting shield panels made by
CAST OPTICS CORPORATION
Hackensack, N. J.

(*Continued from page* 19A)

Ballasts

Chairman—J. W. Griffiths, Southern Methodist University, Dallas, Texas.
Discussion Organizer—George Gilleard, Curtis-AllBrite Lighting, Inc., Chicago, Ill.
Lamp Performance Related to Reference and Commercial Ballasts—J. F. Gilmore, Westinghouse Electric Corp., Bloomfield, N. J., and R. E. Hanson, Westinghouse Electric Corp., Cleveland, Ohio.
Derivation of Ballast-Lumen Ratio — J. C. Heffernan, Sylvania Lighting Products, Inc., Danvers, Mass.
The Mercury Ballast as an Integral Part of the Street Lighting Luminaire — R. W. Haggstrom, Jefferson Electric Co., Bellwood, Ill.

Afternoon Session

Photometry

Chairman — H. P. Davidson, Curtis-AllBrite Lighting Ltd., Toronto, Ont.
Discussion Organizer—L. F. Heckmann, Union Metal Mfg. Co., Canton, Ohio.
The Significance of Numerical Results of Photometry—E. H. Salter, Electrical Testing Laboratories, New York, N. Y.
Photometry of Low Mounted Linear Sources—Domina E. Spencer, University of Connecticut, Storrs, Conn., and C. Edward Kowalski, Sylvania Electric Products Inc., Salem, Mass.
Electroluminescent Lamp Brightness Measurement — Robert W. Wollentin, Stanley R. Goldfarb, Westinghouse Electric Corp., Bloomfield, N. J., and D. Clifford Bell, Photo Research Corp., Hollywood, Calif.
Photometry of Luminaires Utilizing Highly Loaded Fluorescent Lamps—G. A. Horton, R. R. French and John B. Arens, Westinghouse Electric Corp., Cleveland, Ohio.

Applications II

Chairman—Floyd W. Sell, Detroit Edison Co., Detroit, Mich.
Discussion Organizer—J. S. Hamel, Burbank, Calif.
Performance of Air Handling Troffers—Elden H. Witte and Benjamin S. Benson, Jr., Thomas Industries, Inc., Benjamin Division, Des Plaines, Ill.
Maintenance Factors for Interior Lighting—R. N. Edwards, Westinghouse Electric Corp., Cleveland, Ohio.
Engineering Designs for Residential Lighting, Norman Falk, Holophane Co., Inc., New York, N. Y.
Light Transmitting Plastic Enclosure for Outdoor Lighting Equipment—Donald E. Husby and Melvin R. Anderson, Westinghouse Electric Corp., Cleveland, Ohio.

Closing Session

Presiding—Charles L. Amick, Chairman, National Technical Conference Committee.
Report of the Committee on Resolutions—George J. Taylor, Chairman.

Evening Session

Reception and Banquet in honor of President and Mrs. J. B. Browder and incoming President and Mrs. Richard G. Slauer.

1960 Conference Executive Committee

Chairman—Nelson C. Warner, Westinghouse Electric Corp., Pittsburgh, Pa.
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J. A. Hodges	W. H. Roll
Mrs. H. R. Jones	D. C. Thomas

(*Continued on page* 24A)

Gold Medal Acceptance Address

By Willard C. Brown

I appear on this platform before you today with some trepidation because, as you all know, this is indeed a high honor, a very great honor. I am fully aware of this. I, honestly, never thought that I belonged in this "league."

As I look back over my 40 years of lighting, it seems to me that I have been very fortunate in at least three respects:

First, in the particular period in history during which I have been connected with lighting. It has been a great time of outstanding progress in our art and industry. Let me give you just a few comparisons between 40 years ago and now.

Today the cost of electric energy is ⅓ of what it was 40 years ago.

Today the efficiency of light sources is six times as high as it was when I started in the lighting business, just after World War I.

Today there is 20 times as much electrical energy used for lighting as was used for this purpose 40 years ago.

Today the footcandles in typical offices and factories are 50 or 100 times as great as they were 40 years ago.

What an unequalled time in history this has been for being a part of the lighting business!

The second point on which I have been fortunate is this: It seems that I have been very lucky in just happening to be there when a great many significant lighting developments were being conceived, being tried out and being put into practice.

Speaking parenthetically, I think that one of the rich rewards which we lighting men reap is the true satisfaction that comes with being able to improve the lives and living of people. So many of our developments do just that. To pick out just one item of this sort in my own case, I would cite the deep personal satisfaction that I have enjoyed from realizing the fact that for many many years all automobile headlights on our roads have, literally, operated on the optical principles set down in an old patent by Falge and Brown which, incidentally, we worked out together in a long and continuous laboratory session over a long Memorial Day week-end a great many years ago. I am sure that many of you, too, can point with pride and satisfaction to ideas and developments of your own which have made life easier or safer or more pleasant for people.

The third point on which I have been so fortunate is that it seems that somehow I have been able to mix my fun with my work. My friend, Dr. Kingdon, of The Knolls Atomic Laboratory at Schenectady put it very succinctly when he said: "You can't, after all, do much better than to pick an occupation in which you earn your living by doing what you most enjoy doing anyhow." Seems to me that fits me to a "T." Even my hunting, fishing, driving and cruising about have been inseparably interwoven with the fine lighting folks with whom I have been dealing from day to day.

But here I have been looking backwards. (You have to excuse that sometimes when an old fellow gets on his feet.) It is the *future*, however, that is important, and what a future lies ahead of us, spurred on by the new research on what light will do for people and even more that is in the works! Speaking today as a Lighting Consultant with 40 years of rich experience in this lighting business of ours, I would say to our younger members: "There are unbelievable opportunities ahead. Carry our Torch of Lighting high"!

Again, thank you sincerely for the high honor you have done me in awarding to me the Gold Medal of our Society.

RAMBUSCH LIGHTING

CONCORDIA SENIOR COLLEGE CHAPEL, FORT WAYNE, INDIANA
ARCHITECT: EERO SAARINEN & ASSOCIATES

RAMBUSCH DOWNLITE

For twenty years, the Rambusch Downlite has been used in lighting literally thousands of lofty interiors such as Banks and Churches. You benefit by this experience when you specify Rambusch. And you get a classic lighting device that is engineered as well as it is well made.

ALEXANDRE GEORGES

40 WEST 13th STREET, NEW YORK 11, NEW YORK

(*Continued from page 22A*)

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Co-Chairman—George H. Kuhlmann, General Electric Co., Pittsburgh, Pa.

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Chairman, F. E. Duckworth—Graybar Electric Co., Pittsburgh, Pa.

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A. R. Hampsey, Jr.	J. F. Maguire
V. E. Hendrickson	H. E. Siler

Attendance

Chairman—J. P. Boyden, Jr., Westinghouse Electric Corp., Pittsburgh, Pa.

E. C. Carter	B. D. Levaur
W. J. Doherty	C. J. Long
Wayne Kunde	J. B. McNall

Local Publicity

Chairman—H. Briggs, Jr., Duquesne Light Co., Pittsburgh, Pa.

J. R. Dailey	R. W. McKinley
Richard Dwyer	Robert Morgan

Sports

Chairman—J. A. Hodges, J. A. Hodges Co., Pittsburgh, Pa.

H. B. Elliott	P. G. Pierce
N. E. Nuss	C. V. Powell
M. H. Wainwright	

Transportation

Chairman—F. J. Powers, Westinghouse Electric Supply Co., Pittsburgh, Pa.

C. V. Dewitt	Lowry Shepard
W. K. Fornof	W. B. Shores
E. S. Gail	Roy Thomas
J. O. Parke	J. A. Witter

Anchors Aweigh Committee

Chairman—W. H. Roll, West Penn Power Co., Greensburg, Pa.
Cruise Master—George L. Phillips, Westinghouse Electric Corp., Pittsburgh, Pa.

H. E. Foote, Jr.	D. V. Hendrickson
J. S. Frizzell	A. E. Hunter
J. F. Maguire	

Residential Forum Luncheon

Coordinator—Emma Koch, West Penn Power Co., Greensburg, Pa.

Sustaining Members Luncheon

Coordinator — Lawrence W. Hornfeck, Consulting Electrical Engineer, Pittsburgh, Pa.

Joseph Hartman	C. J. Long
Bernard Levaur	D. W. Loucks
A. Paulus	

Progress Committee Report

Coordinator—Hugh S. James, Duquesne Light Co., Pittsburgh, Pa.

Allied Arts Exhibit

Coordinator—L. T. Kight, Duquesne Light Co., Pittsburgh, Pa.

East Central Region Applied Lighting Competition

Chairman—C. D. Miller, Duquesne Light Co., Pittsburgh, Pa.
Vice-Chairman—D. V. Hendrickson, V. E. Hendrickson Co., Pittsburgh, Pa.

East Central Region Attendance Committee

Chairman—C. D. Miller, Vice-President, East Central Region.
W. P. Graham, Philadelphia Section
E. F. Bailer, Capital Section
W. G. Cornelius, Virginia Section
D. C. Thomas, Pittsburgh Section
R. A. Reynolds, Eastern Pennsylvania Section
J. D. Smith, Maryland Section

Pittsburgh Section

Chairman—D. C. Thomas, Sylvania Electric Products Inc., Pittsburgh, Pa.
Vice-Chairman—J. B. McNall
Secretary-Treasurer, H. J. Mazur

Board of Managers

J. P. Boyden, Jr.	J. S. Frizzell
C. M. Crysler	J. A. Hodges

(*News continued on page 29A*)

1961 IES Regional Conferences

Region	Date and Place	Chairman
East Central	April 10-11 Benjamin Franklin Hotel Philadelphia, Pa.	Ralph R. Enghouser Sylvania Electric Products 4700 Parkside Ave. Philadelphia, Pa.
Southwestern	April 17-18 Oklahoma City, Okla.	Paul R. Sheline Paul R. Sheline Co. 1715 Linwood Blvd. Oklahoma City, Okla.
Southeastern/ South Central	April 20-21 Biltmore Hotel Atlanta, Ga.	Charles R. Minors Georgia Power Co. P. O. Box 1719 Atlanta, Ga.
Inter-Mountain	May 1-2 Salt Lake City, Utah	Wayne F. Mulcock Utah Power & Light Co. P. O. Box 899 Salt Lake City, Utah
South Pacific Coast	May 4-5 Sacramento Inn Sacramento, Calif.	M. P. Fenton Smoot-Holman Co. 1331 T St. Sacramento, Calif.
Pacific Northwest	May 8-9 Harrison Hot Springs Harrison, B. C.	E. A. Adams Griffon Sales Ltd. 551 W. 8th Ave. Vancouver, B. C.
Canadian	May 15-16 Queen Elizabeth Hotel Montreal, Que.	J. P. Cristel Shawinigan Water & Power 600 Dorchester St. West Montreal, Que.
Northeastern	June 8-9 Berkeley-Carteret Hotel Asbury Park, N. J.	Bruce J. Jensen Public Service Electric & Gas Co. 80 Park Place Newark, N. J.
Great Lakes	June 19-20 Sheraton-Gibson Hotel Cincinnati, Ohio	H. K. Flint 2926 Debreck Ave. Cincinnati, Ohio

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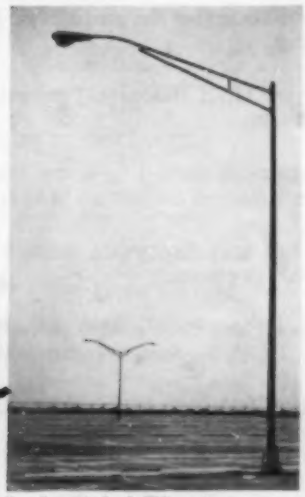

Industrial Plants

Roadway Plazas

UNION METAL

THE UNION METAL MANUFACTURING COMPANY

Canton 5, Ohio Brampton, Ontario

Monotube Area Lighting Poles

Cracking the Light Barrier

This was the title of the inspiring address 130 Sustaining Members of the Illuminating Engineering Society heard at the First Annual Sustaining Member Luncheon, September 13, 1960.

THE SPEAKER— M. I. Allen, Vice-President for Sales, Philadelphia Electric Company.

THE PLACE— Penn-Sheraton Hotel, Pittsburgh, Pennsylvania, during the IES National Technical Conference.

THE OBJECTIVE— Acquainting Sustaining Members with the direct and measurable benefits of financial support to lighting research.

WHY it is essential to support the IES Sustaining Member Research Campaign — highlights from Mr. Allen's talk. . . .

- Blackwell Report first "crack in the light barrier," giving scientific foundation to footcandle recommendations.
- Support of IES and the work of the Illuminating Engineering Research Institute is a sound investment.
- In past five years ten illumination researches have been completed by leading universities under the auspices of IERI. All are of direct value to the lighting industry.
- Ten more IERI Research Projects now in progress need funds for successful completion.
- Knowledge is needed in many other areas—eight of these are earmarked for future Research Projects—pending funds to complete them.
- Goal for next five years must be $100,000 per year; following five years, $150,000 per year.
- Financial and personnel support to the IES and through the S-M Campaign to the IERI, is vital to lighting progress.
- Lighting Industry has an opportunity in this to Think and Act BIG.

YOU are cordially invited to participate as a Sustaining Member of IES in this important Research Campaign—providing leadership in the lighting industry for valuable lighting research.

Copies of Mr. Allen's address are available from IES Headquarters,
1860 Broadway, New York 23, N. Y.

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MEET . . . THE "STARGLOW"

A DISTINCTIVE NEW FLUORESCENT FIXTURE DEVISED TO FILL THE NEED FOR AN ULTRA-LOW PROFILE, RUGGED YET BEAUTIFULLY STYLED UNIT. INTERIOR DESIGNERS AND ARCHITECTS WILL FIND THE TIMELESS SYMMETRY OF LINE AND PROPORTION A HANDSOME COMPLEMENT TO TASTEFUL DECOR AND STRUCTURE WHETHER PERIOD OR MODERN.

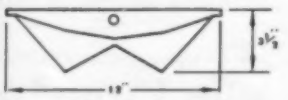
LIGHTING ENGINEERS WILL FIND THE EMPLOYED PRINCIPLE OF LARGE AREA – LOW BRIGHTNESS GIVES UNPARALLELED ILLUMINATION QUALITY, DESPITE THE MOST DIFFICULT FACTORS.

THE STARGLOW HAS BEEN CLEVERLY CONCEIVED TO GIVE EVERY APPEARANCE OF BEING RECESSED WHILE ACTUALLY SURFACE MOUNTED EITHER SINGLY OR IN LINE WITH NO NEED OF ADAPTERS TO JOIN UNITS. IT IS THE FIRST LUMINAIRE EVER BUILT TO FULLY ELIMINATE END PLATE SHADOWS.

A ONE PIECE POLYSTYRENE DIFFUSER PROVIDES UNMATCHED GLARELESS DIFFUSED LIGHT. SEAMLESS AND FULLY SEALED THE DIFFUSER PROVIDES NO PURCHASE FOR DUST AND DIRT THUS MINIMIZING LIGHT LOSS.

THE ALL WELDED STRUCTURE AND HIGH QUALITY ENAMELED FINISH ASSURE A LONG SERVICEABLE LIFE AT AN EXPENSE LEVEL COMPATIBLE WITH THE MOST MODEST LIGHTING BUDGET.

END PLATE CONSTRUCTION PROVIDES VIRTUALLY UNBROKEN ROWS OF GLOWING ILLUMINATION



OVERALL SIZE SHOWS COMPACTNESS AND RECESSED APPEARANCE OF UNIT.

HINGED FROM EITHER SIDE PROVIDES EASY ACCESSIBILITY FOR INSTALLATION OR MAINTENANCE.

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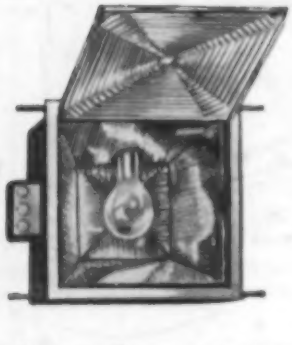

Some call it wonderful! Actually it is just excellent engineering. Proper reflector and proper lens control light! Any lamp bulb in the average fixture gives about 50% useful light. Put that same bulb in a KIRLIN Fixture with ALZAK GlasSurfaced reflector and a Kirlin wide angle 12″ lens and you get at least 70% USEFUL LIGHT!

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You cannot get this winning combination in any other fixture AT ANY PRICE

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(Continued from page 24A)

World Lighting Forum Featured At 3rd National Lighting Exposition

The World Lighting Forum being planned in conjunction with the Third National Lighting Exposition at the New York City Coliseum, March 5-8, 1961, has aroused considerable interest in the industry, according to Harold R. Meyer, producer of the show. At present, the Forum schedule, being planned by an Honorary Committee of experts, includes 12 panel discussions to be held during the four days of the show.

As with the previous expositions in 1958 and 1959, attendance will be by invitation only, to people in the lighting industry and in such allied fields as architecture, construction, and interior design. According to Mr. Meyer, over 200 manufacturers have already contracted for some 250 exhibition booths.

Sponsor of the show is the Lighting, Lamps and Electrical Manufacturers Salesmen's Association, Inc. (LLEMSA).

Survey Finds Fewer Top-Level Jobs, Higher Salaries in Large Firms

Employment opportunities for high-paid executives in big business are decreasing but existing opportunities will pay higher salaries, according to a recent survey conducted by Executive Manpower Corporation, a New York City management recruiting firm. The survey, which studied 133 companies with an average annual sales volume of $113,776,000, found that there would be an average of 2.2 jobs per company in the $10,000- to $75,000-range during the next six months, a slight decline from the average of 2.5 such opportunities per firm tabulated in a March, 1960, survey.

Sales executives were the most desired personnel (28.5 per cent *vs.* 27.1 per cent six months ago), with manufacturing/production executives (21.9 per cent *vs.* 18.6 per cent last time) and general management-administrative executives, including research executives (16.1 per cent *vs.* 11.2 per cent) second and third. Demand for engineering executives has dropped sharply from 22.5 per cent and second position in the March survey to 14.7 per cent and fourth place this time.

Despite the decline in opportunities, however, salaries show a rising trend with 30.8 per cent of the positions in the $20,000 or-more-per-year-category as compared to only 15.5 per cent offering this salary in March. Openings in the $30,000-or-more-per-year-range have increased five per cent from 4.6 to 9.6 per cent of the total market.

According to William A. Hertan, president of Executive Manpower Corporation,

(Continued on page 30A)

SCHEDULED EVENTS

November 21-23, 1960—Canadian Electrical Association, General and Sales Sections, Western Zone, Palliser Hotel, Calgary, Alta.

November 27-December 2, 1960—American Society of Mechanical Engineers, Annual Meeting, Statler-Hilton Hotel, New York, N. Y.

November 29, 1960—American Institute of Consulting Engineers, Annual Dinner, Waldorf-Astoria Hotel, New York, N. Y.

December 4-7, 1960—American Institute of Chemical Engineers, Annual Meeting, Statler Hotel, Washington, D. C.

December 5-9, 1960—National Conference on Application of Electrical Insulation, Conrad Hilton Hotel, Chicago, Ill.

January 23-26, 1961—Plant Maintenance and Engineering Show, International Amphitheatre, Chicago, Ill.

January 24-27, 1961—Society of Plastics Engineers, Inc., 17th Annual Technical Conference, Shoreham and Park Sheraton Hotels, Washington, D. C.

February 5-11, 1961 — National Electrical Week.

February 13-16, 1961—American Society of Heating, Refrigerating and Air Conditioning Engineers, Semi-Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.

February 26-March 1, 1961—American Institute of Chemical Engineers, National Meeting, Roosevelt Hotel, New Orleans, La.

March 2-4, 1961—Optical Society of America, Roosevelt Hotel, Pittsburgh, Pa.

March 5-8, 1961—Third National Lighting Exposition and World Lighting Forum, New York City Coliseum, New York, N. Y.

April 4-6, 1961—St. Louis Board of Trade, Progress in Electrical-Electronic Equipment Exhibit, Exposition Hall, St. Louis, Mo.

April 5-7, 1961—American Institute of Electrical Engineers, Southeast Meeting, New Orleans, La.

April 10-11, 1961—Society of Naval Architects and Marine Engineers, Spring Meeting San Francisco, Calif.

April 10-14, 1961—American Society of Civil Engineers, Phoenix Convention, Hotel Westward Ho, Phoenix, Ariz.

April 19-21, 1961 — American Institute of Electrical Engineers, Great Lakes District Meeting, Minneapolis, Minn.

April 20-21, 1961—Society of the Plastics Industry, Western Section Conference, del Coronado Hotel, Coronado, Calif.

April 30-May 4, 1961—Electrochemical Society Meeting, Claypool Hotel, Indianapolis, Ind.

May 8-11, 1961 — Society of Photographic Scientists and Engineers, Annual Conference, Binghamton, N. Y.

May 17-19, 1961—American Institute of Electrical Engineers, North Eastern District, Statler Hotel, Hartford, Conn.

May 22-25, 1961—American Society of Mechanical Engineers, Design Engineering Division Conference, Detroit, Mich.

June 5-7, 1961—Edison Electric Institute, Annual Convention, New York, N. Y.

June 5-9, 1961—Society of the Plastics Industry, National Conference, Commodore Hotel, New York, N. Y.

June 11-15, 1961—American Society of Mechanical Engineers, Semi-Annual Meeting, Statler-Hilton Hotel, Los Angeles, Calif.

June 18-23, 1961—American Institute of Electrical Engineers, Summer General Meeting, Ithaca, N. Y.

June 26-28, 1961—American Society of Heating, Refrigerating and Air Conditioning Engineers, Annual Meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.

June 26-30, 1961—American Society for Engineering Education, Annual Meeting, University of Kentucky, Lexington, Ky.

July 5-8, 1961—National Society of Professional Engineers, Annual Meeting, Olympus Hotel, Seattle, Wash.

August 22-25, 1961 — Western Electronics Show and Convention, Cow Palace, San Francisco, Calif.

August 23-25, 1961—American Institute of Electrical Engineers, Pacific General Meeting, Salt Lake City, Utah.

September 6-16, 1961—Association for Computing Machinery, National Meeting, Statler-Hilton Hotel, Los Angeles, Calif.

September 14-15, 1961—Engineering Management Meeting, sponsored by American Institute of Electrical Engineers and American Society of Mechanical Engineers, Hotel Roosevelt, New York, N. Y.

September 24-29, 1961—Illuminating Engineering Society, National Technical Conference, Chase-Park Plaza Hotel, St. Louis, Mo.

I. E. S. National Technical Conferences

1961—September 24-29—Chase Park Plaza Hotel, St. Louis, Missouri

1962—September 9-14—Statler-Hilton Hotel, Dallas, Texas

1963—September 8-13—Sheraton-Cadillac Hotel, Detroit, Michigan

1964—August 30-September 3—Fontainbleau Hotel, Miami Beach, Florida

LIGHTING education exhibit, sponsored by Toronto Hydro-Electric System at the Canadian National Exhibition, featured examples of good residential lighting design and a "seeing selector" in which visitors were encouraged to compare their chosen levels of illumination with IES recommendations.

(*Continued from page* 29A)

the survey reflects "industry's serious need today for more experienced and therefore higher paid marketing and administrative executives to ride herd on over-all company operations. And, more than ever, industry seems to need manufacturing specialists to solve production problems, along with first-rank research people. Engineers in the lower executive echelons are less in demand. . . . It would appear that the need for top engineering management is now supplanting the mass need for engineers."

The companies themselves indicated that they expected to encounter the greatest difficulties in finding engineering and sales executives. This, Mr. Hertan interprets as the result of the increase in the number of companies competing for the same sales and engineering talent.

SPE Transactions Begin Publication in January

The Society of Plastics Engineers, Inc., has announced the publication of a new quarterly journal, *SPE Transactions*, to begin in January, 1961. The new publication, which will be devoted to basic science and engineering of high polymers, will be available to both members and non-members of the SPE on a subscription basis. It will contain no advertising.

Publication of the new quarterly is in addition to the *SPE Journal*, the official Society organ. The *Transactions* will be devoted to basic theory, while the Journal will continue to publish technical articles of broad general interest. Melvyn A. Kohudic, editor of the *SPE Journal*, will also serve as editor of the new quarterly.

Subscription costs for the *Transactions* are $15 a year to non-members, $10 to SPE members. Further information is available from the Society of Plastics Engineers, Inc., 65 Prospect St., Stamford, Conn.

Lighting Education Booth Featured At Canadian National Exhibition

This year, the Toronto Hydro-Electric System devoted part of its display at the Canadian National Exhibition to an exhibit on lighting, planned to promote the "better light better sight" philosophy and to present examples of good residential lighting practice.

Most popular features of the display were two attention-getting optical phenomena, the after-image of motion with a whirling wheel and the after-image of color. Inside the booth, a "seeing selector" enabled visitors to check their choice of illumination levels against the IES recommendations (usually a victory for IES), and samples of living room, structural and dressing table lighting techniques demonstrated how to achieve good lighting environments. In addition, the exhibit included simultaneous contrast color demonstrations, a display of the color effects of five commonly used white fluorescent lamps and the four "Q & Q" boxes of size, contrast, time and shadows.

One indication of the interest in this educational display was the 300 requests for additional information received after the close of the show.

The Canadian National Exhibition, which is attended by thousands of visitors each year, was held over a 16-day period.

Industrial Lighting Conference Sponsored by CLI

A full-day program of talks and demonstrations, built around the theme of planning, design and maintenance of industrial lighting, was held at the Chicago Lighting Institute on October 20. Representatives of lamp companies and fixture manufacturers, as well as plant engineers and the editors of *Plant Engineering* magazine, participated in a program which included:

Morning Session

Chairman—Ole A. Hill, Jr., President, Chicago Lighting Institute.
Illumination Levels for Industrial Tasks—Ben F. Avery, District Engineer, General Electric Co., Large Lamp Department.
Choice of Light Sources—Raymond E. Wozniak, Chicago Lighting Institute.
Practical Calculations for General Lighting—R. M. Hall, Wheeler-Fullerton Lighting Division.
Lighting Low- and High-Bay Areas—William Johnson, Application Engineer, Westinghouse Lighting Divison.
Maintaining the Lighting System—A. E. Roberts, Maintenance Engineer, Research Laboratories, General Motors Technical Center.

Afternoon Session

Chairman—Thomas E. Hanson, Editor, *Plant Engineering Magazine.*
Lighting Hazardous Locations—B. S. Benson, Jr., Benjamin Division, Thomas Industries, Inc.
Inspection Techniques—H. E. Sereika, Chicago Lighting Institute.
Lighting Employee Parking Lots and Foodlighting for Identification, Prestige and Protection—Burton Benjamin, Revere Electric Mfg. Co.
Benefits Derived from Good Lighting—E. G. Arsnow, Plant Engineer, Western Electric Co., Inc.
Tomorrow's Developments for Today's Products—Vern Kempf, Electrical Editor, *Plant Engineering* Magazine.

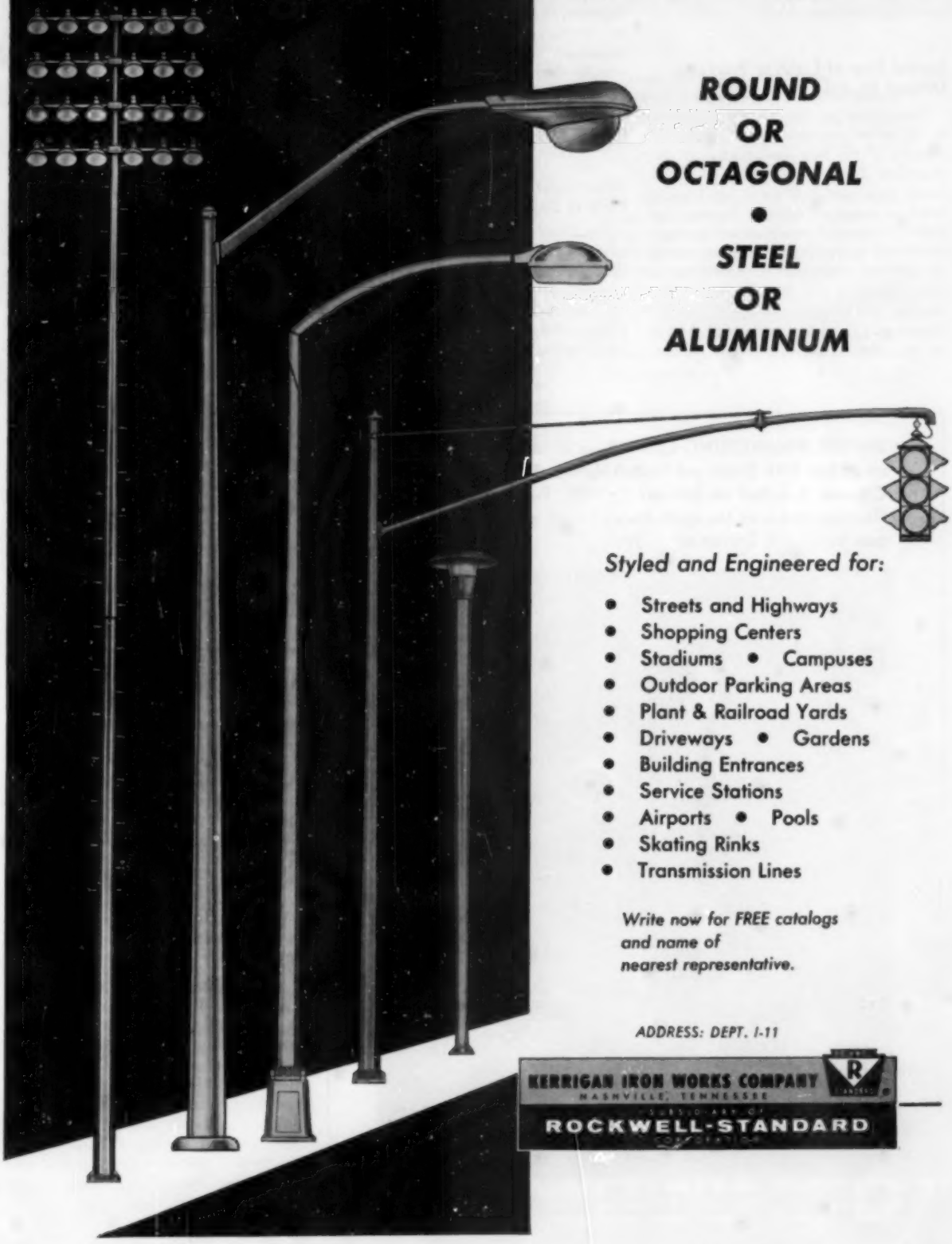
San Jose Chapter Stages Annual Garden Lighting Show

The San Jose Chapter of IES has developed a reputation as the leading IES spokesman for garden lighting. Delegates to the 1959 IES Conference in San Francisco, who viewed the Chapter's display, can attest to the quality of these shows, held annually since 1956.

The first two shows, 1956 and 1957, held at private homes, stirred such interest that *Sunset Magazine*, the West's largest garden publication, offered its Menlo Park Estate for the 1958 and 1959 exhibitions. This year's display, organized by Chapter Chairman, Peter Darnton, was held in Carmel Valley during the early part of October, with the

(*Continued on page* 32A)

NOW... a Pole for EVERY Purpose



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(*Continued from page 30A*)

joint sponsorship of the Carmel Valley Garden Club. The Chapter's October meeting, held at the site of the exhibition, featured a talk by Mr. Darnton which was illustrated by colored slides of outstanding exhibits from the chapter's four previous shows.

Second Year of Lighting Programs Offered by AIEE N. Y. Section

Encouraged by the interest displayed in its 1959 programs, the Illumination Division of the New York Section of the American Institute of Electrical Engineers (organized last year) has inaugurated a series of lighting lectures for 1960. A ten-week study group on modern trends in lighting is being conducted to acquaint electrical engineers, architects, designers and contractors with the fundamental principles of application engineering. Various experts will lecture on such topics as office, store, residential, industrial, street and outdoor lighting, coordination of lighting and architecture and good maintenance practices.

Supplementing this study course, the Illumination Division sponsored an evening program on electroluminescence, with Fred A. Wolfe of Sylvania Lighting Products, Salem, Mass., as guest speaker. Mr. Wolfe's presentation, covering fundamentals, current applications and future developments in the field, was highlighted by a demonstration of a wall of light which was constructed of electroluminescent panels.

Third Lighting Exposition Held in Dallas

The Third Annual Lighting Exposition sponsored by the North Texas Section of IES was held at the Dallas Memorial Auditorium on November 4. Thirty-nine manufacturers from all over the country participated in the exposition with exhibits of the latest developments in commercial, industrial, school and office lighting equipment. Engineers and factory representatives were in attendance at the various booths to discuss design and application problems.

An evening session at the exposition featured a talk by J. B. Browder, past-president of IES, on "Heating With Light," emphasizing the many possibilities in this area created by the higher IES recommended levels of illumination.

"Make Electricity Work for You" Theme of National Electrical Week

"Make Electricity Work for You" has been chosen as the theme for the National Electrical Week, February 5-11, 1961, according to a recent announcement by Harold A. Webster, chairman of the NEW committee. Theme and details for participation in the nationwide observance are included in the 1961 NEW planning guide, now being distributed.

The guide contains sample programs of community and individual activities, a calendar check list and a catalog of special visual materials available in connection with the celebration. Additional copies of the guide may be obtained for $1 from National Electrical Week Headquarters, Suite 306, 407 North 8th St., St. Louis 1, Mo.

National Electrical Week, celebrated annually during the week of Thomas A. Edison's birthday, is sponsored by nine industry groups and endorsed by 15 others.

UNITED ENGINEERING CENTER—a 20-story building going up at East 47th Street and United Nations Plaza in New York City—as it looked on October 6, 1960. Future home of IES Headquarters is on the ninth floor. Target moving date to the new building is September 1, 1961.

ABOUT PEOPLE

Lawrance W. Wightman has been named assistant to the vice-president in charge of operations of the Emerson Electric Manufacturing Co., St. Louis, Mo., according to an announcement by W. R. Persons, president of the concern. Mr. Wightman, formerly associated with the General Electric Co., Fort Wayne, Ind., will be responsible for manufacturing research and development for Emerson's Commercial Department.

New assignments in the Research and Development Division of Day-Brite Lighting, Inc., St. Louis, Mo., have been announced by J. F. Whitehead, Jr., president of the company. Heading the division as director of research and development will be **Charles L. Amick,** formerly executive director of research. The Technical Services Department and the Product Research Department, two new groups within the division, will be

(*Continued on page 34A*)

Expert Commendation...On Two Outstanding HOLOPHANE PRISMALUME® Installations...

HOLOFLUX® NO. 6434
In Offices of La Salle Casualty Co.

"...high level illumination without the usual painful glare"

Statement from Mr. Irving M. Addis, Architect, reporting on the illumination of new offices for La Salle Casualty Co., Chicago, Illinois.

"The lighting throughout the entire area is Holophane #6434 set into a flush mounted acoustical grid ceiling. The illumination level of 130 foot-candles was met without difficulty...The installation has proved to be extremely satisfactory from the decorative as well as illumination standpoint....Office personnel and management like the high level of illumination without the usual painful glare...Holophane is to be congratulated on the efficiency of the fixtures and the complete cooperation of its staff.

Irving M. Addis

Irving M. Addis, Architect

It is always gratifying to receive favorable notice of products or services...The compliments take on special significance when they come from knowledgeable sources....Added incentives to spur Holophane engineers toward new and higher areas of lighting achievement.

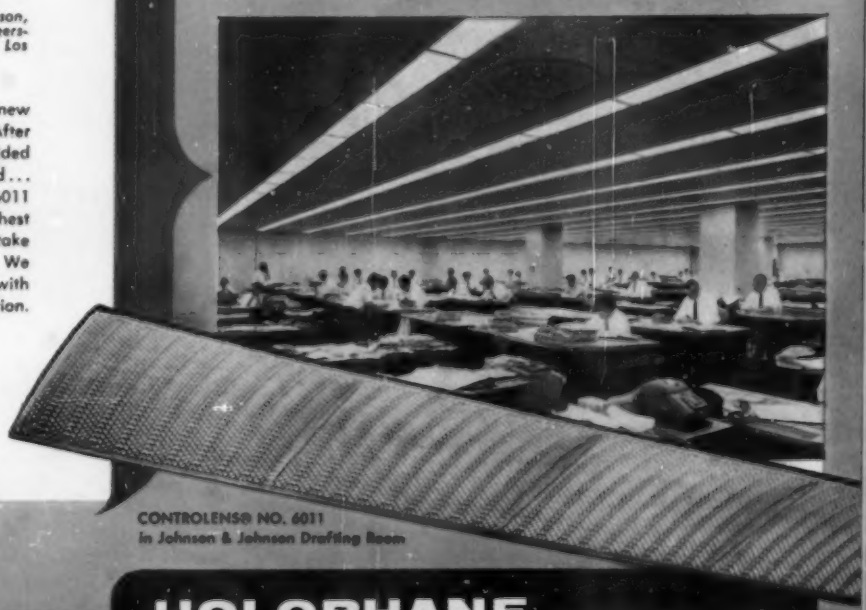
"We take pride in showing our clients our new offices"...

Excerpt from a letter by Mr. J. H. Johnson, President of Johnson & Johnson, Engineers-Architects, Inc., Chicago, Illinois and Los Angeles, California

We selected Holophane lenses for lighting our new offices and 9000 sq. ft. drafting room...After comparing several types of lighting we decided that a lens enclosed unit would be required... Further study proved that Holophane #6011 acrylic plastic Controlens provides the highest efficiency with precise control of glare...We take pride in showing our clients our new offices. We are particularly proud of our drafting room with 160 footcandles of uniform, glare-free illumination.

J. H. Johnson

J. H. Johnson, President



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(Continued from page 32A)

managed by **Richard D. Bradley** and **Murray L. Quin,** respectively. Other groups previously formed include Product Engineering, headed by **Harry J. Falk,** and the Design Department, under the leadership of **Carl X. Meyer.** The division is one of two supervised by **George J. Taylor,** vice president of research, development and marketing.

Dr. W. S. Stiles, O.B.E., D.Sc., F.R.S., has been elected president of The Illuminating Engineering Society in Great Britain for the year 1960-61. Dr. Stiles is a Deputy Chief Scientific Officer on the staff of The National Physical Laboratory, London, which he joined in 1925. Honorary membership in the British organization has been conferred upon **Dr. S. English,** in recognition of his valuable services to the Society and of his contributions to the science of lighting, particularly in the use of glass for the the control of light, and in appreciation of his leadership in the national and international administration of lighting. Also announced by the Society was the selection of **H. C. Weston,** O.B.E., as recipient of the 1960 Leon Gaster Memorial Premium. Mr. Weston received the award for his paper entitled "Rationally Recommended Illumination Levels," presented at the summer meeting of the British IES. The meeting was held in Harrogate last May.

Jefferson Electric Co., Bellwood, Ill., has appointed **Joseph J. Archibald, Jr.,** as manager of advertising and public relations. Mr. Archibald, who is also sales manager of the company's Consumer Products Division, has served in various sales and managerial positions since joining Jefferson in 1949.

Five executive appointments in the merchandising department of the Benjamin Division of Thomas Industries, Inc., Des Plaines, Ill., have been announced by Otis Zumwalt, the firm's vice-president in charge of merchandising. **Robert Gand** has been named director of merchandising, with responsibility for all Benjamin product lines, and for new product development. He succeeds **Michael N. Flynn.** The other new appointments include **Robert Geocaris** and **Fred Farley** as merchandise managers of specific product lines; **Ray Hurley** as chief designer and **Donald Englebretsen** as merchandising assistant.

Wilfred G. Matheson, manager of incandescent lamp research for Sylvania Lighting Products, a division of Sylvania Electric Products Inc., Salem Mass., has been elected to the Committee of Honor for the 1961 meeting of the French Vacuum Society in Paris, France. Mr. Matheson has served for the past year as president of the American Vacuum Society.

JOINT meeting of Coastal Bend Chapter and Residence Lighting Forum featured talk by William Shalda (center), president of Shalda Manufacturing Co., on commercial and residential outdoor lighting equipment. At left is Jack R. Turner, Residence Lighting Forum Chairman; at right, L. H. Kindel, Chapter Chairman. Eighty-nine members and guests attended the meeting.

The Board of Directors of the American Society for Testing Materials has elected **Thomas A. Marshall, Jr.,** as executive secretary of the society. The appointment was effective October 15, 1960. Prior to assuming his new position, Mr. Marshall was senior assistant secretary of the American Society of Mechanical Engineers.

Merendino/Greene and Associates, Inc., Industrial Designers, Pasadena, Calif., have established a Technical Service Division to provide an engineering and laboratory supplement to their design services. The division will be headed by **David Crenshaw,** assisted by **Irvin Anderson.**

Frank F. LaGiusa has joined the C. S. Mersick Electric Supply Corp., West Haven, Conn., as sales manager of the Commercial Lighting Department. Formerly, Mr. LaGiusa was associated with Lightolier Inc., New York City, as a sales engineer and designer.

The appointment of **Luminaires, Inc.** as exclusive sales representatives for Illinois, Wisconsin and Lake County, Indiana, has been announced by the Major Equipment Co., Chicago, Ill. Luminaires is headquartered in Chicago, with a branch operation in Milwaukee. The engineering staffs of both Major and Luminaires will be available for joint installation on any stage lighting or control problem.

BOOKS AND PAMPHLETS

*Books marked * may be inspected in the Technical Office at Headquarters.*

Classification of Electron Tubes,* by J. Haantjes and H. Carter, published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y., 1960, 94 pages, illustrated, soft cover. $3.50.

This book is intended to provide guidance to students and laymen toward the understanding of the various types of electron tubes including photocell tubes. A brief and simple explanation of the principle operation phenomena is given in the first part of the book. Later each type is discussed and explained with the help of well-drawn, color diagrams. A final chapter covers applications.

Christmas Greetings With Light, Booklet S-696, edited by Myrtle Fahsbender, available from the Westinghouse Lamp Division, Box 388, Bloomfield, N. J. Price: 10 cents.

Designs and instructions for lighting windows, doorways, mantels, walls, tables, the facade of a house, grounds and garage doors in the spirit of the Christmas season are contained in this illustrated booklet. Designed as an aid in highlighting carefully-planned decorations, it includes suggestions for the apartment dweller as well as for the homeowner; for do-it-yourself enthusiasts and for those who prefer ready-made or-

(Continued on page 36A)

THEY'RE ALL POINTING TO QPCX7400*

QPCX7400 incorporates the exclusive "SUNLUX", clear plastic lens panel with greater resistance to discoloration. SUNLUX reduces direct glare. It promotes seeing comfort.

*QPCX7400 is an ultra-shallow, surface-mounted Visionaire lighting fixture to which they are all pointing.

Architects are pointing to it in their specifications because they like its modern, wafer-thin appearance and the way it "blends" with the ceiling.

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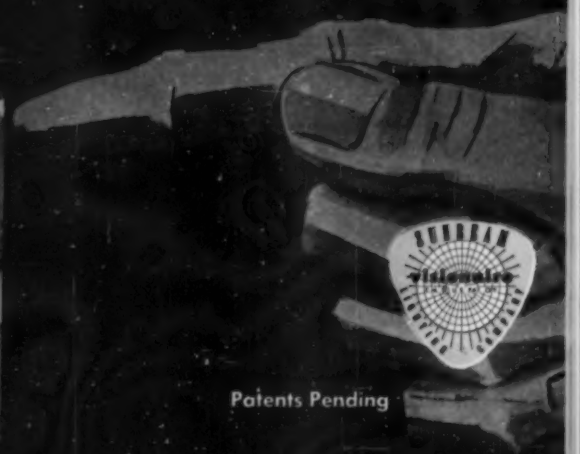

Patents Pending

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SUNBEAM LIGHTING COMPANY | 777 E. 141h Pl., Los Angeles, Calif.
3840 Georgia Street, Gary, Indiana

(Continued from page 34A)

naments. Other sections of the booklet, scattered throughout with short synopses of Christmas customs in other countries, deal with safety in outdoor lighting and tree trimming, including a chart listing the number of lights required for trees from four to ten feet tall.

Special quantity prices are available.

1939 American Society for Testing Materials Proceedings, Vol. 59, published by the American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. 1424 pages, $12.00.

The 1959 volume of this annual publication records the technical accomplishments of the ASTM during the past year. Included are all reports, papers and discussions accepted by the Society for its Proceedings, complete coverage of the papers presented at ASTM's 62nd Annual Meeting in June, 1959 and the Third Pacific Area National Meeting, September, 1959, with title and author listings for the conference sessions.

NEW MEMBERS

At the meeting of the IES Council Executive Committee on October 6, 1960, the following were elected to membership. Names marked * are transfers from Associate Member Grade.

ALABAMA SECTION

Associate Members:

Parker, C. E., 2653 Fifth St., N. E., Birmingham, Ala.

Phillips, George, Mayer Electric Supply Co., Inc., Birmingham, Ala.

ARIZONA SECTION

Members:

*Ross, N. F., 4227 No. Monte Vista Drive, Scottsdale, Ariz.

ARKANSAS CHAPTER

Associate Member:

Hicks, D. L., Dorsey Electric Supply Co., N. Little Rock, Ark.

BLUENOSE CHAPTER

Associate Member:

Carruthers, J. L., Robinson Electrical Ltd., New Glasgow, N. S.

BRITISH COLUMBIA SECTION

Member:

*Foster, H. G., Northern Electric Co. Ltd., Vancouver, B. C.

CAPITAL SECTION

Member:

*Griffin, N. L., U. S. Public Health Service, Division of Hospital & Medical Facilities, Washington, D. C.

Associate Member:

Gibson, S. B., U. S. Army Engineer Research & Development Laboratories, Fort Belvoir, Va.

CENTRAL ILLINOIS CHAPTER

Member:

Sanders, C. R., Caterpillar Tractor Co., E. Peoria, Ill.

CENTRAL NEW YORK SECTION

Members:

*Carpenter, P. J., New York State Electric & Gas Co., Auburn, N. Y.

*Douglas, G. W., Corning Glass Works, Corning, N. Y.

Reese, F. H., Le Valley, McLeod, Kinkaid Co., Elmira, N. Y.

CENTRAL OKLAHOMA CHAPTER

Associate Members:

Johnson, J. W., 3121 N. W. 11th, Oklahoma City, Okla.

Perrault, H. J., Western Electric Co., Oklahoma City, Okla.

CHICAGO SECTION

Member:

*Turner, Amos, Meissner Engineers, Inc., Chicago, Ill.

Associate Members:

Agrell, W. C., Benjamin Division, Thomas Industries, Inc., Des Plaines, Ill.

Blum, R. A., W. R. C. Smith Publications, Chicago, Ill.

Christensen, A. H., Advance Transformer Co., Chicago, Ill.

Chuba, Joseph, The Pyle-National Co., Chicago, Ill.

Daly, C. H., B. J. Martin Co., Inc., Chicago, Ill.

Kuhr, A. F., Benjamin Division, Thomas Industries, Inc., Des Plaines, Ill.

Vrba, R. J., Steber Manufacturing Co., Broadview, Ill.

Wits, Harold, Duray Fluorescent Mfg. Co., Chicago, Ill.

CLEVELAND SECTION

Members:

Hienton, R. C., Cleveland Electric Illuminating Co., Cleveland, Ohio.

Kender, F. A., Cleveland Electric Illuminating Co., Cleveland, Ohio.

*Schiller, H. G., Lighting Institute, General Electric Co., Nela Park, Cleveland, Ohio.

Associate Member:

Brown, R. M., The Wakefield Co., Vermilion, Ohio.

COASTAL BEND CHAPTER

Member:

Dosser, H. M., Central Power & Light Co., San Benito, Texas.

Associate Member:

Repper, F. C., Central Power & Light Co., Alice, Texas.

CONNECTICUT SECTION

Associate Member:

Hays, H. M., The Travelers Insurance Co., Hartford, Conn.

EASTERN NEW YORK SECTION

Associate Members:

Curtis, E. J., Watervliet Arsenal, Watervliet, N. Y.

Mason, R. C., 33 N. Ferry St., Schenectady, N. Y.

EDMONTON SECTION

Associate Member:

Tunstall, A. A., Swift Canadian Co., Ltd., Edmonton, Alta.

GEORGIA SECTION

Associate Member:

Horning, R. B. Jr., Graybar Electric Co., Atlanta, Ga.

GOLDEN GATE SECTION

Associate Members:

Taylor, Arthur, Taylor Ceilings, San Francisco, Calif.

Wyman, W. M. Jr., Prescolite Mfg. Co., Berkeley, Calif.

GOLDEN WEST CHAPTER

Associate Members:

Hewlett, J. C., Sylvania Electric (Canada) Ltd., Saskatoon, Sask.

Pettick, Margaret, J. I. M. Services Ltd., Regina, Sask.

Stave, J. A., S & T Electric, Yorkton, Sask.

Stetner, Norman, Stetner Electric Ltd., Regina, Sask.

HEART OF AMERICA SECTION

Associate Member:

Miller, J. L., Continental Electric Co., Kansas City, Mo.

(Continued on page 50A)

CONTRIBUTION of $150 to United Engineering Center Building Fund was made by Eastern New York Section. Harold Freedman (far left), Chairman of Section's fund-raising August outing, presents check to Section chairman, John C. Gould (second from right). Looking on are C. E. Waldron (second from left), secretary-treasurer; Randall Rice, vice-chairman.

. . . a cross-section of Gotham's new Recessed Low-Brightness Downlite with minimum trim . . . engineered for general illumination and good concealment of the light source . . . applications include stores, schools, restaurants, offices, banks, churches, showrooms, hotels, lounges, auditoriums. For complete data, write to:
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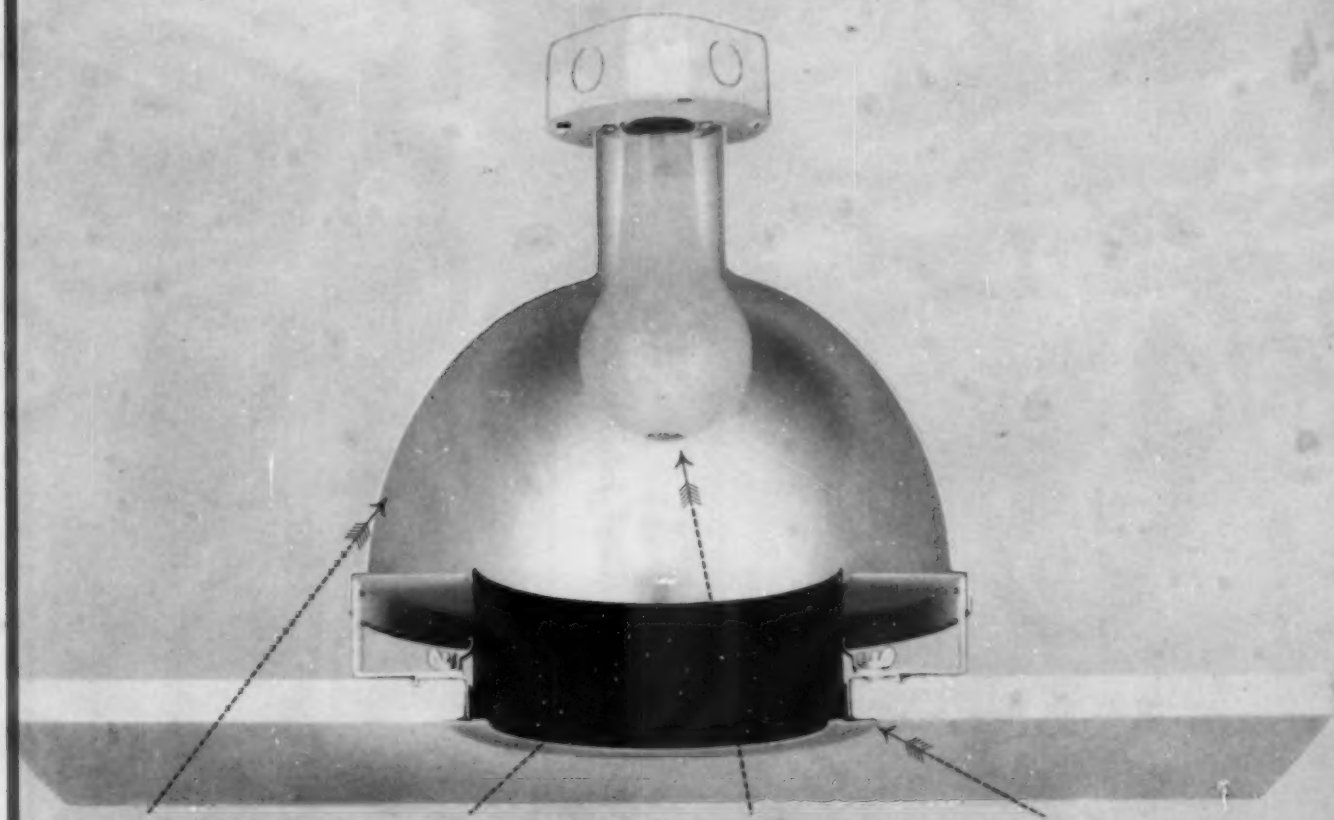

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This optically-precise Alzak reflector unit is designed to produce wide-angle distribution with sharp visual cutoff at 45°.

LOW BRIGHTNESS

Spill-light is trapped in the lower portion of the unit, eliminating glare at the ceiling opening. Wattages range from 100 thru 300 . . . aperture diameters vary from 4 inches thru 6 inches.

EASY MAINTENANCE

The lamp can be replaced without dissassembly or removal of any parts . . . being accessible directly through the aperture, either by hand or with a pole.

SMALL FLANGE

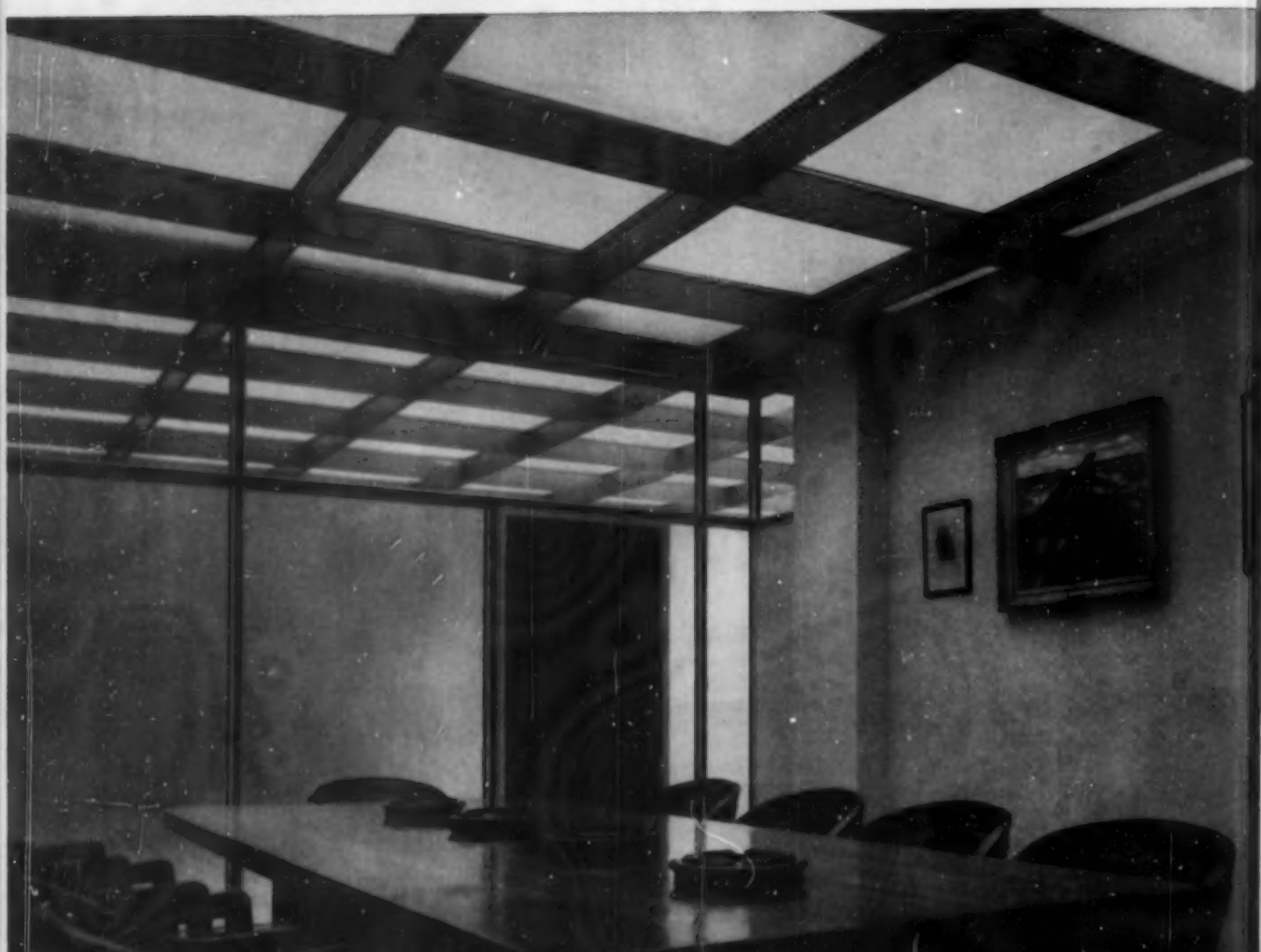
These units are designed with a minimum ceiling flange . . . just 13/16th of an inch in width.

CATALOG NUMBER	LAMP	APERTURE DIAMETER	CEILING CONSTRUCTION
803	100W. A21 I.F.	5 1/8"	DRY
813	100W. A21 I.F.	5 1/8"	PLASTER
805	100W. A21 I.F.	4"	DRY
815	100W. A21 I.F.	4"	PLASTER
806	150W. A23 I.F.	5 1/8"	DRY
816	150W. A23 I.F.	5 1/8"	PLASTER
822	200/300W. PS30 I.F.	6"	DRY
832	200/300 W. PS30 I.F.	6"	PLASTER

ABOVE ALL:

Styrene lighting louvers molded of

LUSTREX® PERMA TONE



Louvered ceiling manufacturer: Sigma III by The Wakefield Company, Vermilion, Ohio. Lighting louvers molded by American Louver Company, Chicago, Illinois. Associate Architect: Hubbell-Benes-Hoff. Contractor: McDowell Company, Inc., Cleveland, Ohio.

Why is more Lustrex perma tone used for louvered ceilings than any other ultraviolet light-stabilized styrene? First, in clear white and a complete color range, perma tone exceeds IES-NEMA-SPI joint specifications for ultraviolet light-stabilized styrene. Second, you can illuminate large areas at low cost—with good diffusion, and uniform light distribution. Third, perma tone fixtures are light in weight, yet dimensionally stable.

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The Ultra-Lux is available 12" wide (two-lamp 4 ft. or 8 ft.) and 24" wide (four-lamp 4 ft.) as shown above.

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*General Electric's trademark for configurated fluorescent lamps

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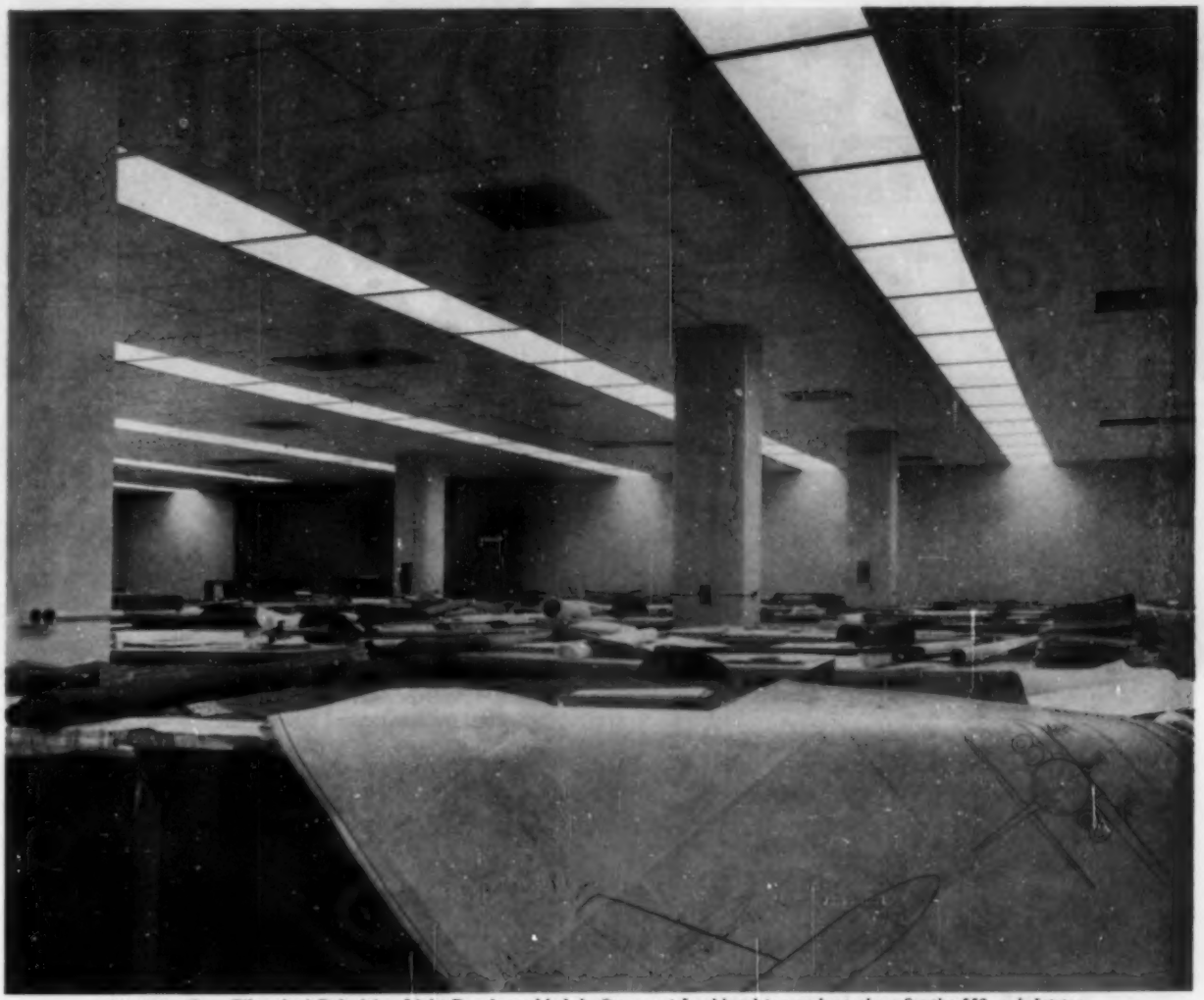


Marietta, Ga.—Fiberglas† Polarizing Light Panels enabled draftsmen at Lockheed to produce plans for the 550 mph Jetstar utility transport in time to meet production deadline, with no undue eye fatigue, according to Lockheed-Marietta engineers.

***J. S. JOHNSTON,** Lockheed Plant Electrical Engineer, goes on to say about Fiberglas Polarizing Light Panels: "We like the panel so much that it has been put in several other areas besides the Jetstar Drafting Room including office areas, classrooms, data processing rooms, corridors, and even recreation areas. The Jetstar Drafting Room had 756 Fixtures with the Polarizing Light Panel."*

Lockheed's experience with the Polarizing Light Panel has been duplicated all over the country in practically every type of situation. If you will fill in the attached coupon, a showing of the informative new film strip, "Lighting Through Fiberglas" will be arranged at your convenience.

Owens-Corning Fiberglas Corporation
717 Fifth Avenue
New York 22, New York

OWENS-CORNING FIBERGLAS

Gentlemen:

Please have your representative contact me to arrange a showing of "Lighting Through Fiberglas."

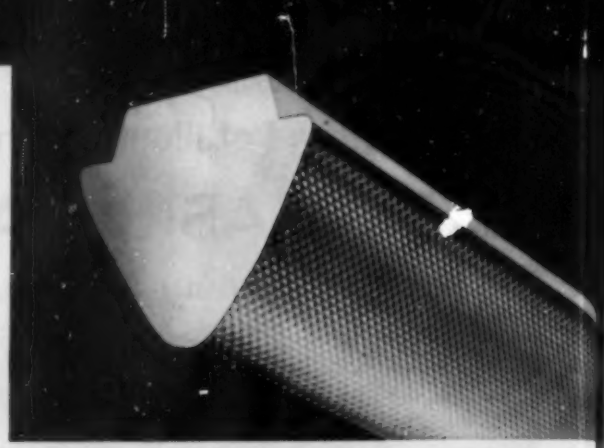
NAME_____

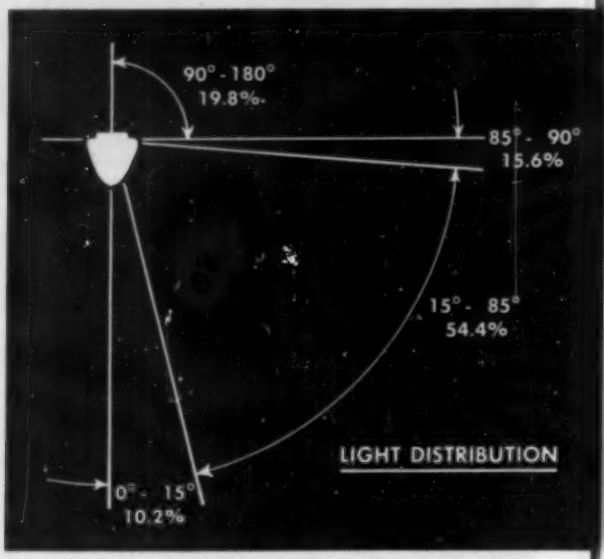
ADDRESS_____

CITY_____ ZONE_____ STATE_____

†T.-M. (Reg. U.S. Pat. Off.) O-C.F. Corp.

Attractive LPI VeeLens corridor luminaire has V-shaped prismatic diffuser and convex reflector which concentrates greatest amount of light on wall areas. Viewed endwise, it provides excellent brightness control—maximum brightness does not exceed 350 footlamberts in the 45° to 90° zone.





Light distribution for LPI VeeLens. Percentage figures show amount of light (based on 100% for half the luminaire) which falls in various sectors. Upward component permits proper brightness ratios and relieves contrast on the corridor ceiling.

New, low-cost LPI VeeLens puts high levels of useful light on corridor walls

The VeeLens fluorescent corridor luminaire is engineered for efficient application to school corridors, library stacks, stock room aisles, and pedestrian tunnels. It solves the two important corridor lighting problems at lowest possible cost: (1) most of the useful light is directed where you want it—on the vertical surfaces, and (2) brightness down the corridor is controlled to a comfortable level without glare.

Formerly, only far more expensive fluorescent luminaires with intricate shielding, or incandescent luminaires with special lenses directed the useful light so effectively. Now, LPI's VeeLens does the job better at lower cost because it utilizes a clear prismatic diffuser containing thousands of 8-sided prisms. This diffuser combined with the unit's convex reflector distributes useful illumination in the pattern most desirable for corridor lighting—the "butterfly curve." The result is a high level of illumination on the vertical surfaces with controlled brightness when viewing parallel to the luminaire.

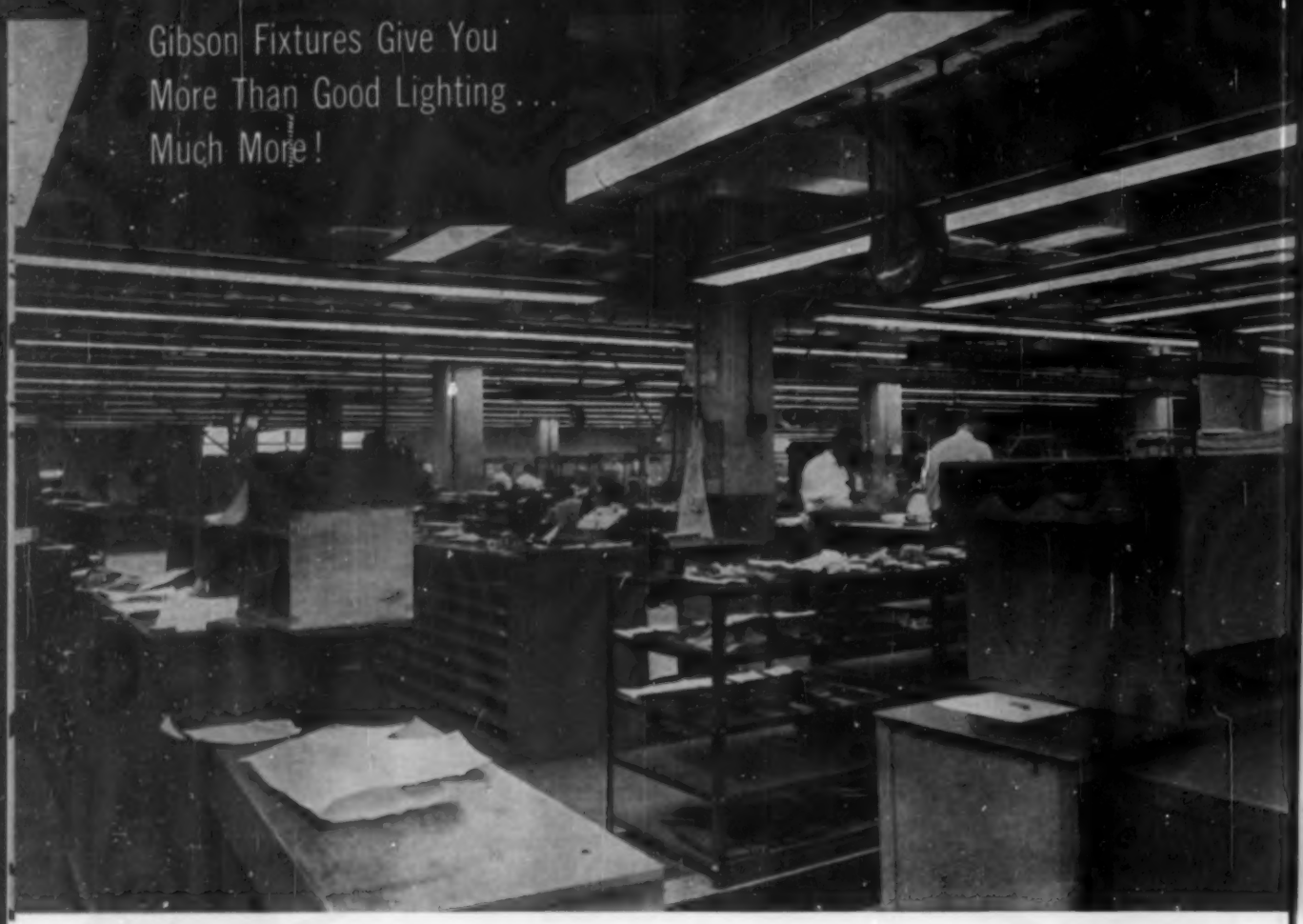
VeeLens luminaires are available for surface or pendant mounting, individually or in continuous rows. They utilize one 48" rapid-start lamp in a 4-ft. luminaire, or two 48" rapid-start lamps, tandem, in an 8-ft. luminaire. Diffusers hinge from either side.

For complete information, write for VeeLens bulletin

LPI FLUORESCENT LIGHTING

Lighting Products Inc., Highland Park, Illinois

{OOOH look at that mess!
. . . and it's so unnecessary
since Jefferson announced
DRI-LOK
the ballast
that can't
drip compound
Gone forever is the danger of messy compound leakage. In the new Jefferson DRI-LOK ballast, conventional compound has been replaced by a newly developed thermo-setting material. This dry, solid-fill material is so physically and chemically stable it cannot soften or liquefy, cannot combine or react with any other material in the ballast.
It fills the entire case and permanently bonds case, core and coil into one solid, voidless unit.
The New DRI-LOK Ballast is Engineered to Meet Newly Proposed CBM Higher Light Output Standards
Write today for complete details and specifications.
NOW IN PRODUCTION
Jefferson DRI-LOK
New Blue FLUORESCENT BALLASTS
JEFFERSON ELECTRIC COMPANY • BELLWOOD, ILLINOIS



Architect: Leland, Larsen, Bradley & Hibbard; Electrical Engineer: McCarron & Sullivan; General Contractor: Perini Corp.; Electrical Contractor: Hixon Electric Co.

NEW BOSTON NEWSPAPER BUILDING LIGHTED WITH GIBSON "PLUG-IN" FIXTURES

The new Boston Herald Traveler building is lighted throughout with Gibson "plug-in" fixtures. Industrial-type fixtures were used in the mechanical departments and commercial fixtures were installed in the offices. Both types are mounted on the exclusive Gibson Uni-Race. They plug-in like an electric appliance and may be unplugged instantly for servicing, respacing, or replacing any time without tools. More and more important firms are enjoying the economies that this exclusive Gibson feature offers them—lower installation cost, permanence of alignment, and substantial savings in maintenance.

Write for complete information about Gibson "Plug-in" Fixtures today.

GIBSON

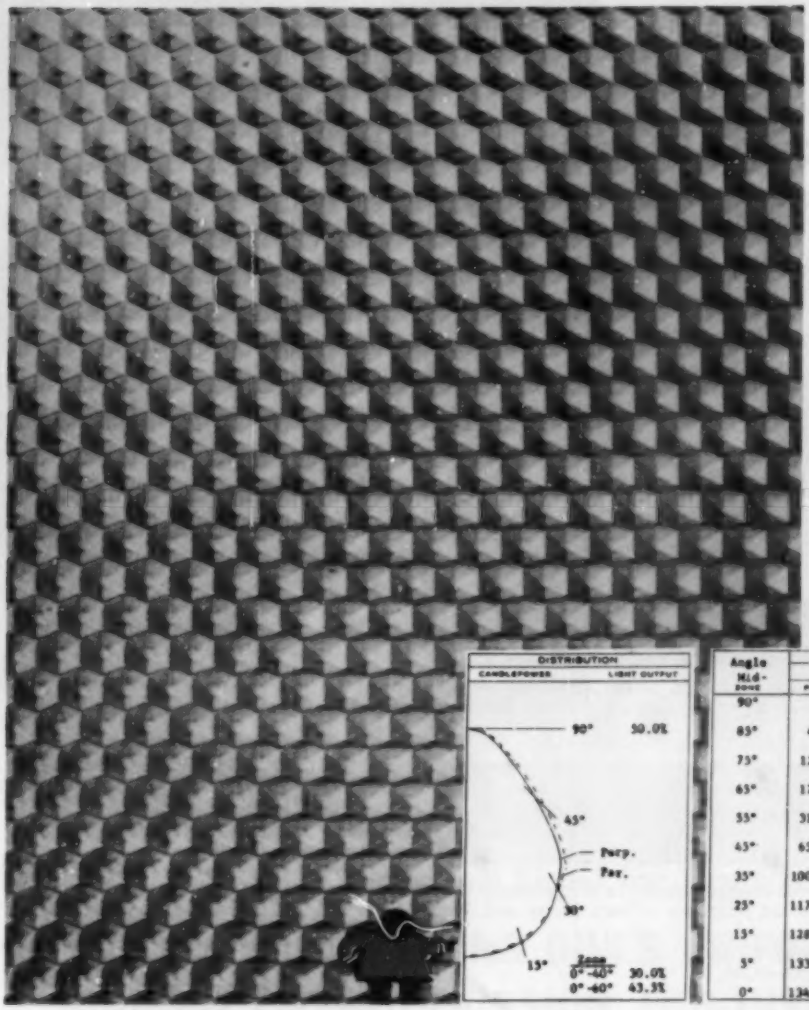
Gibson LIGHTING

Makers of
THE FIXTURES THAT JUST "PLUG-IN"
PAT. PENDING

COMMERCIAL, TROFFERS, INDUSTRIAL

GIBSON MANUFACTURING COMPANY
1919 Piedmont Circle, N. E., Atlanta 9, Georgia

announcing the New EXTRU-LITE® Pattern R-7

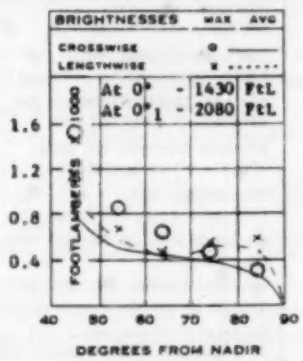


our famous plastic low brightness lensware — NOW extruded in a Brand NEW PATTERN.

Pattern R-7, with optically engineered hexagonal pyramids, permits the light to enter at all angles from the light source. It diffuses and refracts the light onto the work surface with a low brightness that is highly desirable for all types of visual tasks.

This 6-sided prismatic pattern controls, directs and reflects the rays to provide a glareless, more uniform light distribution.

Angle Mid-Zone	Mid-Zone Candlepower Horizontal Angles					Lumens
	Par.	22½	45	67½	Perp.	
90°	0		0		0	-
85°	40.2		40.2		25.3	40
75°	127		125		96.9	125
65°	176		200		179	188
55°	317		313		279	276
45°	653		620		534	472
35°	1003		1000		970	625
25°	1177		1198		1196	551
15°	1281		1293		1301	365
5°	1334		1333		1338	127
0°	1341		1341		1341	-



Samples and small production orders available immediately up to 24″ wide. Production orders within 10 days.

Write or call our Dept. BK at our factory or our Sales Offices listed below today for Sample of Extru-Lite R7.

• Tougher • Safer • Lighter than other Materials

THE ROTUBA EXTRUDERS, INC.

A DIVISION OF WALJOHN PLASTICS, Inc.

MAKERS OF PLASTIC EXTRUSIONS FOR INDUSTRY

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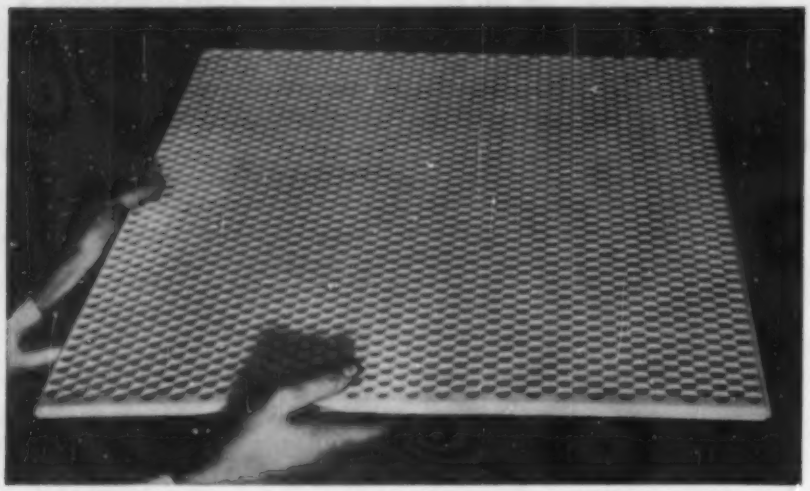
CIRCLGRID

Non-Combustible Vinyl Louver–A new luminous rigid panel for the Lighting Industry



A 2′ x 2′ Circlgrid Louver showing the pleasing proportion of the cells. Hundreds of circular cells in each panel provide controlled visual comfort and permit air circulation through the plenum.

CROSS SECTION THRU "CIRCLGRID" PANEL

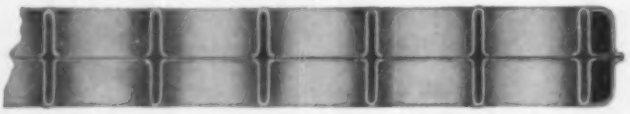


Diagram shows how the top and bottom thermo-formed sheets are electronically fused to a center membrane at all edges and around the periphery of each louver cell. Panel dimensions:

23¾" square x ½" deep Weight—13 oz.
23¾" x 47¾" x ½" deep Weight—32½ oz.

Hospital uses

"CIRCLGRIDS"

"Circlgrid" perforated luminous Louvers are widely used in the new addition to Hamot Hospital of Erie, Pa. Locations include Information, Business Offices, Nurses Stations, Dining Area, Elevator Lobbies and the Hamot Aid Shop. Uniform, shadow-free illumination without glare is provided in all these areas.

Architects
JOHNSON, GRAY & ASSOCIATES
Erie, Pa.

General Contractor
SESSINGHAUS AND OSTERGAARD
Erie, Pa.

Address Box 655-S, Erie, Pa., for Circlgrid samples, UL test report and test data showing exceptional lighting characteristics.

circvac plastics

Circlgrid Louvers are approved for use in all states including New York and California. These rigid lightweight vinyl louvers are attractive and highly efficient light diffusers. They are processed by Thermoforming two vinyl sheets and Electronically fusing them to a center vinyl membrane. This new vinyl material is specially formulated to maintain new highs in light stability. Unique circular cells permit installation under fire extinguishers, assist in sound absorption and permit plenum air circulation to prevent dust accumulation. CIRCLGRID-45 is available in nominal sizes of 2′ x 2′ and 2′ x 4′, with or without perforations, in various translucencies and with or without sealed-in metal perimeters.

Presently Authorized CIRCLGRID Licencees

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2828 Ford St. • Oakland 1, Calif.

J. A. WILSON LIGHTING
P. O. Box 3037 • Erie, Pa.

IN CANADA

J. A. WILSON LIGHTING & DISPLAY LTD.
280 Lakeshore Rd. • Toronto 14, Ont., Canada

At General Electric's Ordnance Department Gauge Control Room, "Circlgrid" ceiling panels made of high-impact BAKELITE rigid vinyl sheet meet stringent lighting requirements needed for reading optical-type gauges and instruments. Insert shows close-up of one of the panels.

Controlled Light for Control Room

LUMINOUS CEILING GIVES UNIFORM DIFFUSION, HIGH LIGHT TRANSMISSION, FOR INSTRUMENT READING

Shadow-free lighting! That's one of the critical requirements for this gauge control room of General Electric's Ordnance Department plant in Pittsfield, Mass. At the same time, uniform light diffusion and high lighting efficiency are essential.

To meet the requirements, "Circlgrid" panels were designed by Cirvac Plastics of Erie, Pa.—employing new *high-impact* BAKELITE rigid vinyl sheet. Each panel is made from two vacuum-formed sheets bonded together. The many small circular depressions in the panels are punched out. The over-all result is intrinsic light control, with brightness reduced in the glare zone between 45° and 90°. This permits higher foot-candle installation.

The holes also reduce dust accumulation, simplify cleaning, and allow free air circulation. Transmission efficiency is 68 per cent, compared to the 48 per cent of most standard vinyl diffusers. Illumination in this installation is at the 150 foot-candle level, with a brightness ratio never exceeding 5 to 1.

Highly resistant to warping, cracking, the panels go years without discoloration from ultraviolet. They are self-extinguishing, and the holes allow sprinklers above to operate efficiently—the National Board of Fire Underwriters has approved vinyl diffusers in this regard with perforations of ¼ inch or larger. "Circlgrid" panels have been approved by the building code of nearly every major city, including the strict New York code.

Look into ceilings made with high-impact BAKELITE rigid vinyl sheet. Write for more information. Dept. FP-72, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y.

UNION CARBIDE

BAKELITE and UNION CARBIDE are registered trademarks of Union Carbide Corporation.

WORLD'S HIGHEST SINGLE LIFT LOCK FEATURES Servisafe POLES

Floating guard boom and lock (background) at T.V.A.'s Wilson Dam, Florence, Alabama

EASE OF LUMINAIRE MAINTENANCE ASSURES YEAR-ROUND LIGHTING EFFICIENCY FOR GIANT NEW LOCK AT WILSON DAM

To expedite barge traffic through Wilson Dam, a new 110 x 600 foot single lift lock has been installed by the Tennessee Valley Authority. This giant lock, capable of handling an entire tow in a single lockage, will operate around-the-clock. A high level of illumination is required therefore for night operations. In addition, lighting efficiency must be maintained year-round. Thompson "Servisafe" Poles met the specification for this job and 80 units were installed along the lock, its floating guard boom and a new steel bridge over the lock.

"Servisafe" poles permit fast, safe, all-weather luminaire servicing *at ground level.* They also reduce maintenance costs because a single unskilled man can quickly relamp and clean a pole-mounted light without hazard or costly auxiliary equipment.

6901-TE

For details on "Servisafe" poles, write today for BULLETIN PWB-59.

T-E

THE THOMPSON ELECTRIC CO.

P.O. BOX 873-K • CLEVELAND 22, OHIO

(Continued from page 36A)

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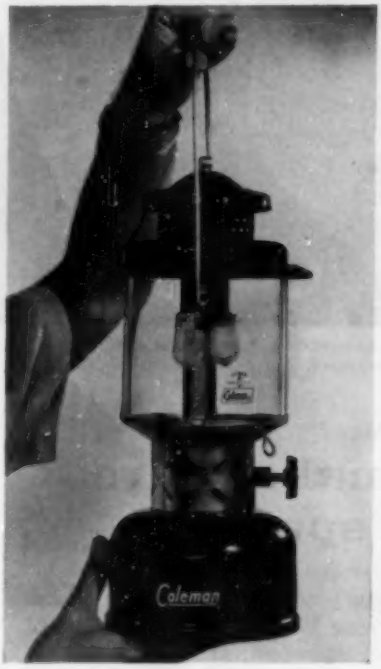
(Continued on page 53A)

Glass for lighting

A QUICK LOOK AT LIGHTING PROBLEMS ✓ SOLUTIONS ✓ USES ✓



A CASE OF THERMAL AND MECHANICAL SHOCK

Drive along a northern lake on a spring night and you'll spot dozens of lights waltzing their beams out across the water. The lights belong to fishermen. They come from portable lanterns that burn pressurized gasoline in thorium mantles.

Since spring nights get cold, and the mantle burns at 3,000 degrees F., the chimney has to be tough to take it. PYREX® brand globes are used, because they stand up under the internal heat and ambient temperatures.

These globes take rough handling, too. They're tough enough so that the lanterns take the bouncing and jouncing that's part of being packed into a hunting or fishing camp deep in the woods. You'll find them suspended from tree limbs swaying in the breeze . . . a dependable light source far from home.

A PROBLEM OF COLOR

Even for people used to bigness, Grand Coulee Dam is a mighty impressive sight. Stand 4 football fields end on end, add half of another for good measure, and that's how high it is. Put 42 of them end to end and you've got an approximate idea of its width.

At night it's even more dramatic, when floodlights with red, green, blue and yellow front lenses focus on it. By blending them, various other colors are formed. White, for example, is made by mixing green, red and blue; but only a very *precise shade* of blue will do. To produce it, we developed what we call "Front Glass Blue."

Each heat-resistant lens measures 18 inches across and weighs 7 pounds. All 686 lenses were made with *standard* molds. Just another example of how we develop a *special*, then *mass produce* it to keep costs down.

GLASS THAT TAKES HEAT AND COLD IN STRIDE

Fly at night, and the glass lights on radio and TV towers guide your plane safely on its way. The glass has to take the elements *and* the tremendous heat generated, and *at the same time*. Sometimes the glass takes heat on the inside and cold on the outside. Still, the lights blink, flash and shine all year in any weather, signalling to your pilot to let him know that he's at a safe altitude and on course.

Maybe when you reach your destination it's pea-souped in. The control tower helps your pilot glide down until he sees the runway lights. He zeros in between them and sets down, softly, safely.

These lights have to be dependable. That's why so many of them are made by Corning.

A PROBLEM OF SAFETY

One of our customers needed a light in a touchy spot—an extremely hazardous location in a chemical plant. The worry was one of possible bulb breakage. The tiniest spark could have caused an explosion, perhaps a loss of life. We designed a specially-strengthened globe to cover the bulb, just in case it did break. The plant has sufficient light, sufficient safety. Should you need it, we can supply you with a glass that will let you work at peak performance without a hint of danger.

These are just a smattering of the lighting problems we've licked. Perhaps your problem is a bit different. That's what we thrive on. Let us know about it. Maybe you would like to know more about glass and what it can do. Just send the coupon.

CORNING MEANS RESEARCH IN GLASS

CORNING GLASS WORKS, 61 Crystal Street, Corning, N.Y.

Please send me the following:

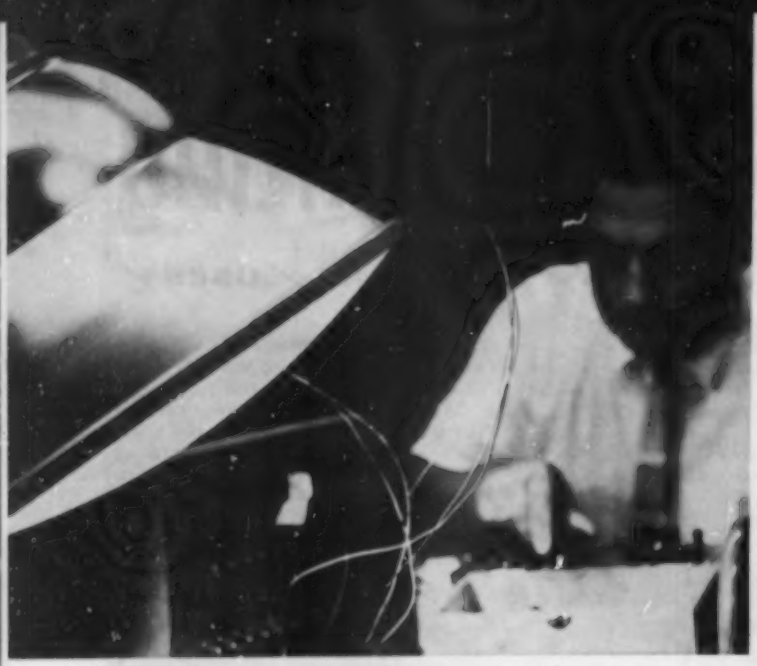
- ☐ Properties of Selected Commercial Glasses
- ☐ Designing with Glass for Industrial, Commercial and Consumer Applications
- ☐ Commercial Lighting Applications Guide

Name..... Title.....

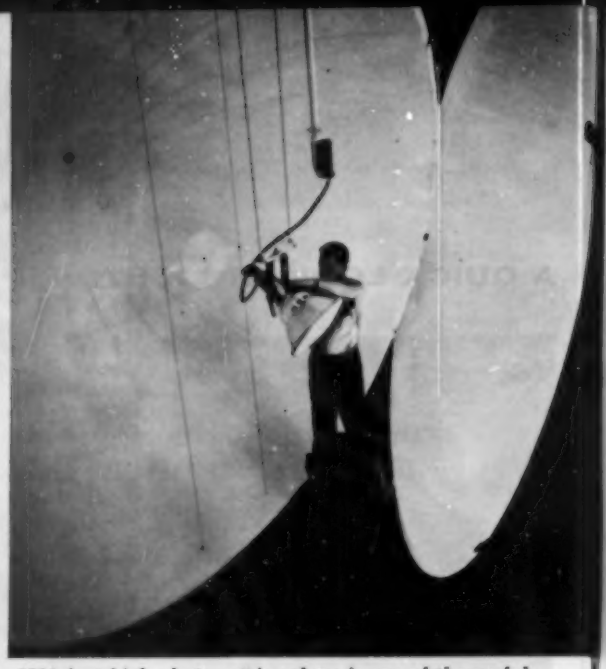
Company.....

Address.....

City..... Zone..... State.....



Engineer checks temperature rise of experimental floodlight as part of prototype development.



12½-foot-high photometric sphere is one of the useful tools in Revere's research and development laboratory.

What makes Revere the consultant's outdoor lighting choice?

Revere creative engineering makes sure you get all of the light you specify

Consulting electrical engineers know that their clients get all of the light they pay for from Revere equipment. That's because Revere policy is to design up to a performance level, never down to a price level.

From product design right through application engineering, Revere people refuse to compromise with quality in construction and performance. A Revere luminaire not only puts out the total light specified, it puts it out with maximum utilization and efficiency.

The next time you're ready to specify outdoor lighting equipment, be a little skeptical, a little demanding. Ask yourself whether you've really been getting the engineered performance you've specified. Then choose the best way to do your job from the widest line of quality fluorescent, incandescent, and mercury luminaires, poles, fittings and accessories on the market. You'll find that Revere equipment is *design* matched for peak lighting efficiency and *structurally* matched for strength, balance and trouble-free installation.

Write for the comprehensive Revere catalog. Ask any Revere sales engineer to answer your questions about how our complete lighting line can serve your interest. Remember, if you don't see what you need, Revere can design it for you — and get it out to your job on time.

Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (In suburban Niles)
Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles
In Canada: Curtis Lighting, Ltd., Leaside, Toronto, Ontario

Research worker selects a calibrated lamp to aid in development of a new outdoor lighting unit.

Revere application engineers fit design-matched equipment to a variety of routine and unusual jobs.

Unique "shower bath" tests weather resistance of newly-designed luminaire under extreme conditions.

(*Continued from page* 50A)

Lewis, R. F., Incandescent Supply Co., Sacramento, Calif.
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White, W. C., Graybar Electric Co., Inc., Sacramento, Calif.

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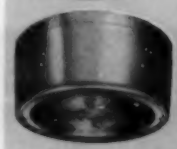
(*Continued on page* 55A)

Swingaway maintenance! Hinged ring and chain for easy relamping and cleaning.

OTHER DRUM UNITS

B 1215 Long-Boy Ellipse; intense narrow-beam light, specular Alzak reflector



B 1210 Metal drum units, concave prismatic lens with genuine Alzak reflectors.

B 1192 Prison and psychiatric units; cast guard, shatter-proof prismatic lens, tamper-proof screws.

B 1618 Gym drum units, with guard or louver, single to quadruple mountings.

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HAVE HIGH EFFICIENCY, CONTOUR ALZAK REFLECTORS

Real parabolic-design provides permanent, efficient light control. Unlike flat-pan or aluminum-foil types, Alzak contour reflectors can't come ungluded, tarnish, or become permanently discolored from lamp heat. Super white opal glassware has satin-finish ceiling ring. Unit gives excellent downlight, plus good ceiling illumination above and around the fixture. Models to accommodate up to three 100-watt lamps. Complete selection available.

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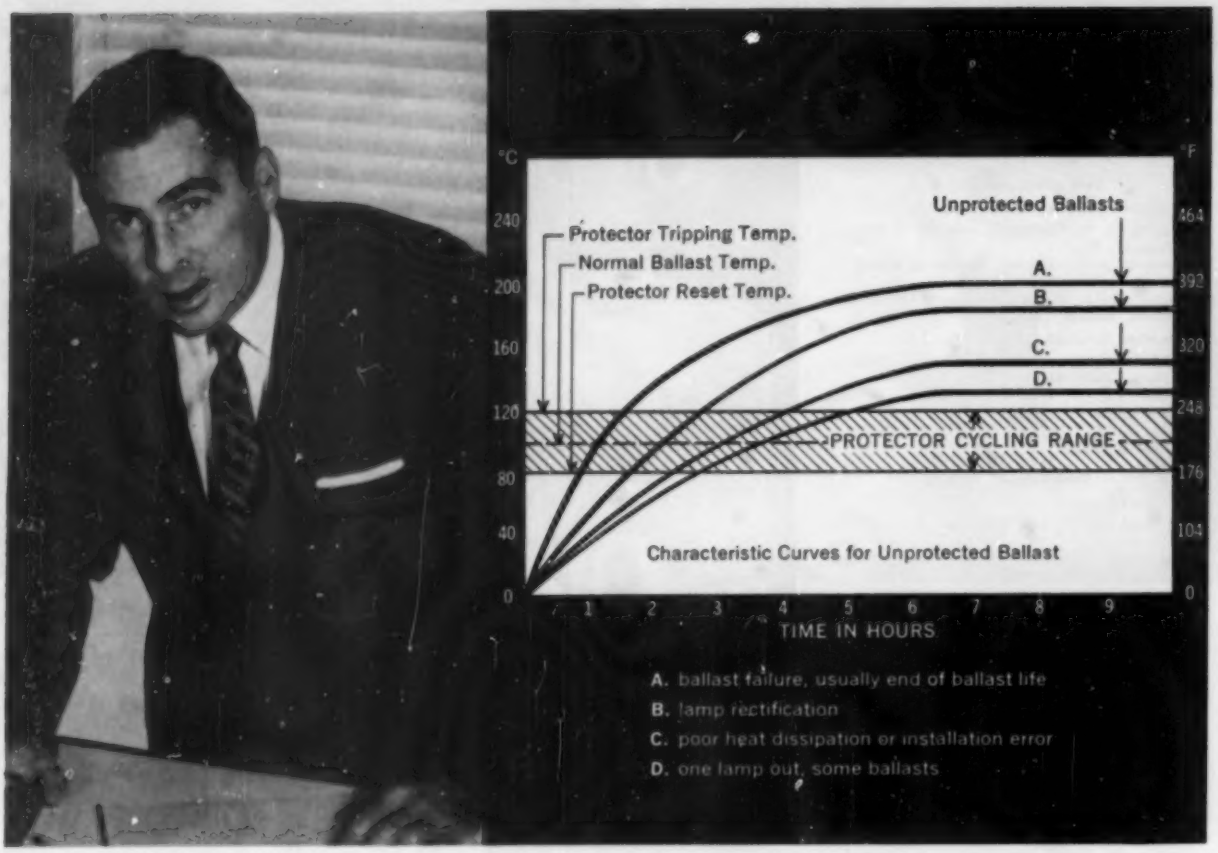

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— *that's good enough for me!"*

More and more Electrical Engineers always specify thermally-protected ballasts. First, because it protects themselves and their reputation against the mistakes of others. Second, for minimal extra cost *only* thermally protected ballast lets them pass on to their clients these tremendously important benefits:

assurance of . . . properly operating ballasts, fixtures and installation within U/L temperature limits — because a protector properly applied to a ballast will keep the ballast operating within a safe temperature range under all conditions. (see chart).

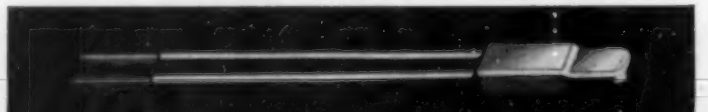
assurance that . . . faults will be discovered while the contractor is still on the job equipped to make corrections.

assurance of . . . normal ballast life when a fault is corrected if the cause of over-temperature is external to the ballast — if the fault is in the ballast, temperature limits are held to a safe level until it is convenient to change the ballast.

assurance that . . . no dripping, fires or violent failures will occur at the end of ballast life.

These are important benefits to you and to your clients. They are easy to get. Simply use the specifications shown here. Ballasts equipped with KLIXON Protectors can be supplied to your fixture manufacturer by all six leading makers of ballasts. Write for full engineering details.

*name on request



KLIXON ® PROTECTOR (actual size)

USE THIS THERMAL PROTECTION SPECIFICATION

"Ballasts shall be thermally protected against overheating by a built-in overheat protector sensitive to both winding temperatures and current which will prevent winding temperatures from exceeding 120° C. with the exception that the peak temperatures in the first few cycles may exceed this. The protector must allow the winding temperatures to reach 105° C. minimum under normal conditions in a 40° C. ambient without opening the circuit to the primary winding, and after opening shall not reclose above 85° C. Fixtures must be so designed that ballast coil temperatures shall not exceed the U/L limit of 105° C. in a 40° C. ambient."

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(Continued from page 53A)

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(Continued on page 56A)

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A COMPLETE LINE FOR UP TO 200W LAMPS Single and two-light fixtures for walls, ceilings, all exteriors requiring lasting beauty and superior performance. Wide range of finishes. Write for Catalog Section AP.

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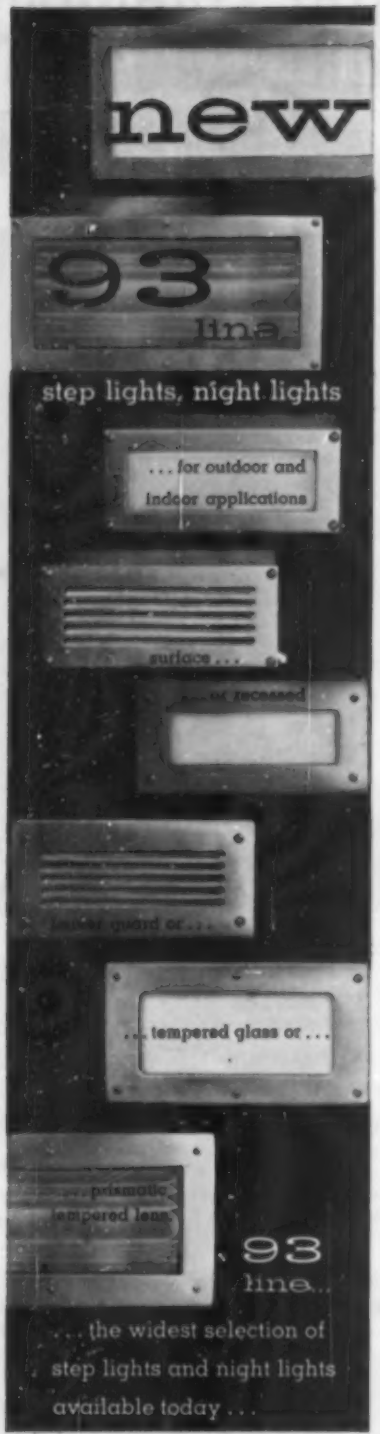

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(*Continued from page 55A*)

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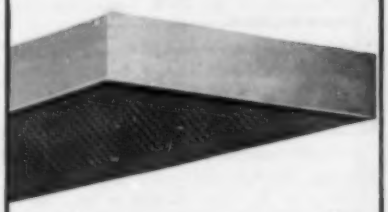

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Crisp, trim lines plus deluxe, quality features and true versatility make the VEGA's value unequalled in its moderately-priced class of surface mounted fluorescent fixtures.

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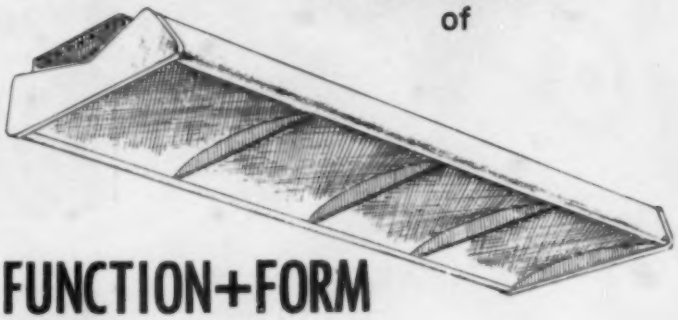

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Since our recent merger with a large electronics firm, it has been decided by Management to expand our national distribution in certain marketing areas in line with our expanded and accelerated production capability. Knowledge and experience in Sales-Engineering type contact with Architects, Engineers, Contractors, and Distributors is a prime requisite. Territorial coverage is being expanded on a national scale with many prime areas available. Please submit complete facts in first letter which will be held in strictest confidence. Address Box 456, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

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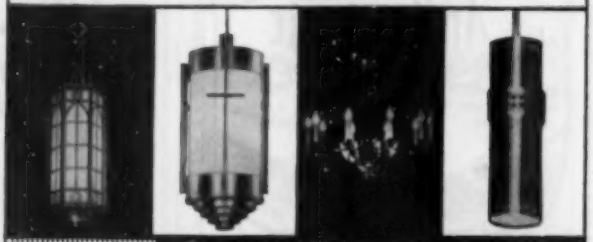

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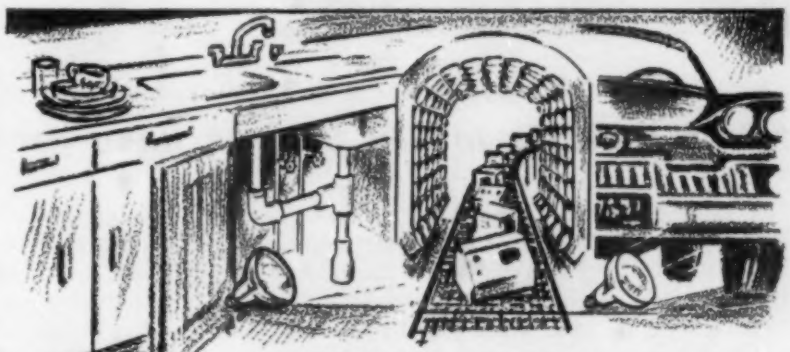
The eyes of insects are less attracted to yellow light than white light — a fact which makes yellow "bug" lamps desirable illumination for outdoor living.

Incandescent lamps made for outdoor use are protected from rain, snow, heat, and cold by glass which can withstand abrupt temperature changes — similar to the glass used in household baking dishes.



Light THAT'S NOT MEANT TO BE SEEN

Infrared heat and drying lamps are used for heat not light; to thaw frozen pipes, dry clothes, warm cold motors, quick dry film, dry paint, etc.

THERE ARE OVER 3,000 types OF CHAMPION LAMPS FOR INDUSTRIAL AND COMMERCIAL USE

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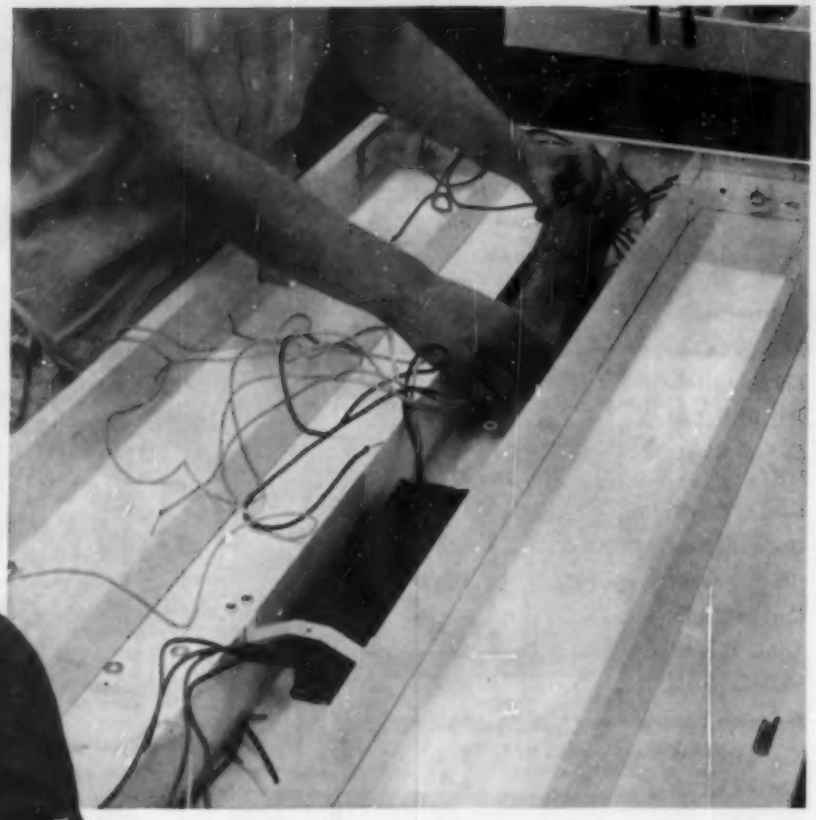
Below: *Harold A. Glass, Executive Vice-President of Lighting Products Inc., Highland Park, Illinois.*



Above: *Installation of Sola ballasts in LPI fluorescent luminaire helps assure peak performance and reliability.*

A fixture manufacturer talks about Sola ballasts and Sola's in-warranty replacement plan—

"Sola ballasts in LPI fixtures have proved 99.53% reliable"

"Detailed records on a typical sample lot of 19,000 Sola ballasts installed in LPI fixtures show these ballasts are 99.53% reliable," states Harold A. Glass, Executive Vice-President of Lighting Products Inc. "This low failure ratio of less than one-half of 1% is excellent for this type of equipment.

"With Sola ballasts, our fixtures deliver the performance we've engineered into them . . . thus guarding our reputation as a manufacturer of high-quality industrial and commercial fluorescent lighting products. Reliable operation of Sola ballasts in our fixtures means more satisfied customers, from wholesaler to contractor to user. We like the way Sola's in-warranty replacement plan works to eliminate any inconvenience for us in the rare instance of an in-warranty ballast failure. It assures speedy replacement that helps the customer, too."

Mr. Glass is one of many fixture manufacturers who benefit from the superior performance and reliability of Sola ballasts — reliability that makes possible Sola's unusual in-warranty replacement plan. This plan enables wholesalers to provide a replacement — *at full profit* — for any Sola ballast which may fail within warranty. If the wholesaler does not stock Sola ballasts, he will provide an equivalent certified CBM ballast of another make. This replacement service is provided by 354 qualified wholesalers located throughout the United States.

Full light output, quiet operation, cool in-fixture performance, full-rated lamp and ballast life that means excellent operation — these are some of the advantages that are offered by Sola ballasts and that have been proved by tests under the most severe operating conditions. *For full information on Sola ballasts, write or call your nearest Sola representative.*

SOLA

B P
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A Division of Basic Products Corporation

SOLA ELECTRIC CO.

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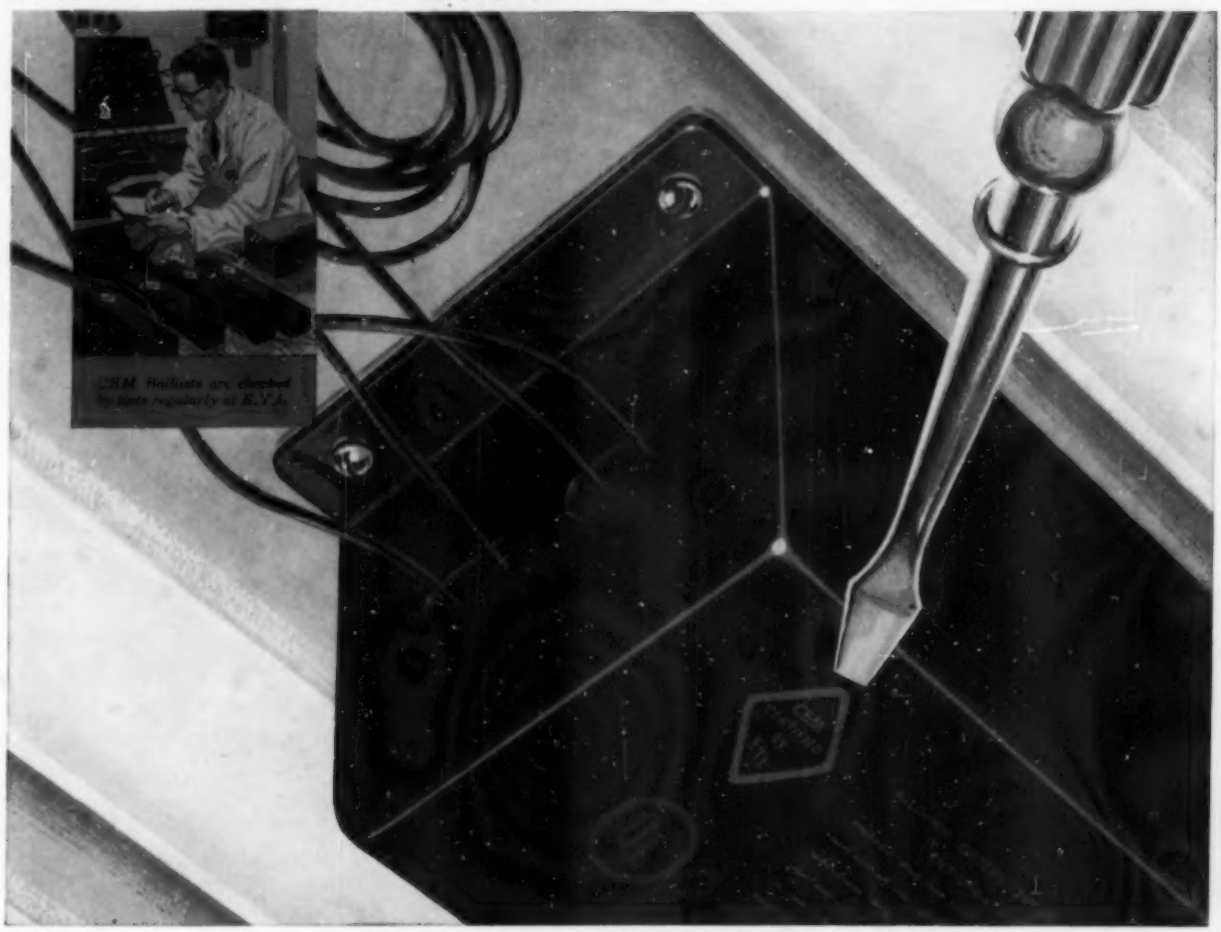
THIS EMBLEM ON A FIXTURE BALLAST BRINGS YOU PRACTICAL ADVANTAGES

CBM CERTIFIED by ETL

Participation in CBM is open to any manufacturer who wishes to qualify

4-60



Among them . . . up to 40% more light output and sustained peak light output to give the benefits of today's recommended higher lighting levels. You also get long lamp and ballast life . . . positive starting . . . U. L. listing . . . **in short, performance that meets specified CBM standards** . . . checked and certified by Electrical Testing Laboratories. Enjoy CBM benefits on fixtures that you sell or specify. And to keep pace with CBM progress, ask us to start mailing you "CBM NEWS".

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GUTH GATEWAY

A winning combination of rugged strength, beauty and efficiency in a concave plastic fixture! The Gateway introduces a new concept of design and construction. Plastic is basic . . . but no wrap-a-round. Concave bottoms hinge separately . . . choose GrateLite Louver Diffuser* or Prismoid GrateLite Louver-Lens**.

100 FC AT 4 WATTS PER SQUARE FOOT!

the most efficient, most rugged, concave-plastic drop luminaire available

Examples — Estimated Ft. Candles — 80/50/30 R. F. — 9′ 0″ to 9′ 6″ Mtg. Ht. — 10′ 6″ to 11′ Ceil. — Row Mtgs.

with Concave PRISMOID					with Concave GRATELITES				
Rows of lamps	Room Index				Rows of lamps	Room Index			
	D	C	B	A		D	C	B	A
2-lite	52 FC	59 FC	67 FC	71 FC	2-lite	48 FC	54 FC	62 FC	66 FC
3-lite	78 FC	89 FC	101 FC	107 FC	3-lite	72 FC	81 FC	95 FC	99 FC
4-lite	99 FC	113 FC	129 FC	136 FC	4-lite	91 FC	105 FC	118 FC	125 FC

Notes: Room index D is for 30′ x 36′ room using 3-28′ rows
Room index C is for 40′ x 48′ room using 4-40′ rows
Room index B is for 50′ x 56′ room using 5-48′ rows
Room index A is for 60′ x 60′ room using 6-52′ rows

Guth LIGHTING since 1902.

THE EDWIN F. GUTH CO.
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